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FEASIBILITY STUDY

OF THE

McFADDEN PEAK FLUORSPAR PROPERTY

GILA COUNTY, ARIZONA

FOR

TRIANGLE MINING COMPANY

ADDENDUM 1

TO

PHASE 1

2 of 2.

March 1979

PINCOCK, ALLEN & HOLT, INC.
4420 East Speedway Blvd.
Tucson, Arizona 85712

Registered Professional Engineer (Mining)
CERTIFICATE NO.
8864
STANLEY
MAXWELL MOOS
DATE SIGNED
Arizona U.S.A.

Y and A), for areas of ore already mined, for dip of the vein, and for the angular relation of the vein to the section. Vein strands in the hanging wall of block I have been added to the main vein. No area of fluorspar has been assigned to the pillars above the number 1 underground workings. The area to the east of block BB, on the east end of the known vein, represents a good exploration target, but it cannot be given any value in the current calculations of indicated ore reserves.

In the following table, visual estimated of "65% plus" in CaF_2 by Western Fluorspar's consultant, Charles Sewell, are shown as 65(e) and 28(e) SiO_2. Width of fluorspar is in feet, normal to the vein. Volume of each block is in cubic feet.

BLOCKS IN SECTION A-A'

Block	Width	CaF_2 %	SiO_2 %	Volume Feet^3
A_1	2.8 ft.	57.98	35.20	4,600
A_2	2.3	50.76	42.34	15,000
B	6.1	63.50	30.70	42,700
C	2.5	21.56	65.80	33,100
D	3.8	72.03	21.64	80,400
E	2.0	42.37	53.22	24,400
F_1	6.1	74.83	22.28	115,900
F_2	8.0	79.29	16.20	176,000
G_1	4.7	83.56	12.00	98,700
G_2	3.5	66.75	26.40	52,500
G_3	5.0	75.23	21.30	70,000
G_4	5.3	59.22	33.00	80,100
H_1	1.9	21.03	73.43	30,400
H_2	1.1	39.77	55.12	19,800
H_3	2.2	81.76	14.24	52,800
H_4	2.0	56.60	37.46	26,000
H_5	2.8	61.79	32.40	56,000
H_6	2.6	90.24	8.50	67,600
I_{1a}	9.6	41.31	50.08	79,200
I_{1b}	4.5	45.50	47.29	69,300
I_2	6.3	66.20	27.79	105,900

Block	Width	Grade		
		CaF_2 %	SiO_2 %	Volume Ft^3
I_3	7.6	77.23	18.39	79,800
J	8.9	80.23	14.80	78,300
K_1	9.0	65(e)	28(e)	64,400
K_2	5.0	65(e)	28(e)	24,400
K_3	8.0	65(e)	28(e)	28,600
K_4	3.0	65(e)	28(e)	21,500
L	2.0	65(e)	28(e)	26,700
M_1	5.1	77.68	20.60	47,800
M_2	4.0	72.88	21.92	113,900
M_3	4.5	75.42	23.56	35,200
N_1	10.4	44.18	46.64	93,900
N_2	8.3	44.62	51.60	137,000
O	6.9	80.80	16.76	144,900
P	3.5	79.92	17.00	272,300
Q	7.3	84.51	9.17	208,100
R	9.1	65.10	29.99	302,800
S	3.2	35.91	61.18	46,400
T	8.9	61.76	30.56	152,100
U	6.2	77.76	19.60	46,500
V	12.9	65(e)	28(e)	297,200
W	4.6	65(e)	28(e)	117,200
X	6.7	65(e)	28(e)	316,600

Block	Width	Grade		
		CaF_2 %	SiO_2 %	Volume Ft^3
Y	3.5	65(e)	28(e)	92,400
Z	7.7	65(e)	28(e)	292,600
AA	6.2	65(e)	28(e)	342,200
BB	10.0	91.68	4.77	825,000
		TOTAL VOLUME		25,508,200

The total volume in all blocks, with widths ranging from 1.1 to 12.9 feet and grade ranging from 21.03 to 84.51% CaF_2 is 5,508,200.

Divided by the tonnage factor, 12.5, the blocks total 440,656 tons. For a tonnage factor explanation, see topic 4 on this appendix.

The volume of blocks having less than 3.0 feet width and/or less than 40% CaF_2 (blocks A, C, E, H, L, and S) is:

A_1	2.8 Ft.	57.98% CaF_2	4,600 ft^3
A_2	2.3	50.76	15,000
C	2.5	21.56	33,100
E	2.0	42.37	24,400
H_1	1.9	21.03	30,400
H_2	1.1	39.77	19,800
H_3	2.2	81.76	52,800
H_4	2.0	56.60	26,000
H_5	2.8	61.79	56,000
H_6	2.6	90.24	67,600
L	2.0	65(e)	26,700
S	3.2	35.91	46,400

Total of all low grade and/or thin blocks:
(402,800 Ft^3) = 32,224 tons

With the low grade block "S" plus 8 of the 11 remaining thin blocks calculated with adjacent waste rock to a mining width of 3 feet (blocks C, H_1 and H_2 omitted as too low in grade at a 3 foot mining width), the minable tonnage in the thin blocks is (396,544 Ft^3) = 31,724 tons.

Total vein except for blocks C, H_1 and H_2:
(440,656) - (32,224 T) - (31,724 T) = 440,156 Tons.

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Tonnage with 85% mining recovery and 15% wallrock dilution: (440,156)(.85)(1.15) = 430,252 tons.

Working estimate, within nearest 5%, minable ore: 450,000 tons, excluding the inferred tonnage to the east of block BB for which open pit mining is proposed.

2. <u>Grade of Ore</u>

Grade in place is based only on minable blocks at greater than 3 foot width for which assays are available. A weighted average is used for each

block. A small error involved in taking wall-rock in the thinner blocks is considered to be balanced by the error in estimated grades of 65%(e).

Σ [(Ft^3)(Assay)] /Σ (Ft^3) = Grade

2,880,000/4,000,000 = 72% CaF_2

980,000/4,000,000 = 25% SiO_2

Weighted average of eleven samples of minable ore assayed for $CaCO_3$ = .0176. Average grade in place:

72% CaF_2

25% SiO_2

1.8% $CaCO_3$

1.2% undetermined

Average grade with 15% wallrock (silica) dilution:

72/1.15 = 63% CaF_2

(26)(1.15) = 29% SiO_3

Nominal 1% $CaCO_3$

Nominal 7% undetermined (mostly alumina in wallrock)

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3. Classification of Reserves

The reserves in this report are classified as indicated ore in the "measured, indicated inferred" system used by the U.S. Bureau of Mines and by many mining companies. Indicated ore is: "tonnage and grade are computed partly from specific measurements, samples, or production data and partly from projection for a reasonable distance on the basis of geologic evidence. The sites available for inspection, measurement, and sampling are too widely or otherwise inappropriately spaced to permit the mineral bodies to be outlined completely or the grade to be established throughout." Measured ore would be so closely sampled in trenches, workings, and drill holes that the accuracy limits will not "...be different from the computed tonnage by more than 20 percent". Inferred ore is based on geologic knowledge of a deposit (or portion of a deposit) for which few, if any, samples are available.

In the "proved, probable, possible" system used by some mining companies, the reserves in this report would be classified as "probable",

a more flexible term indicating that the tonnage and grade are "computed partly from geologic projection and are based on evidence from widely spaced drill holes".

As shown in Figure 5-4, there is at least one drill hole, mine face, or sample trench for each ore block. Still, none of the blocks are so closely sampled that they can be classified as "measured" or "proved". The lower limit of each block is based on a geologic observation that the ore changes into a system of silica-rich and fluorite-poor veinlets when the hanging wall of the vein passes downward from hornfels or argillite and light gray thin bedded quartzite into massive red quartzite. As long as one of the two vein walls is above the red massive quartzite, the vein contains fluorspar; where both walls are in red massive quartzite, the vein is filled with silica rather than fluorspar. While there may be vein zones in the lower massive red quartzite that are favorable to fluorspar at greater depth than shown on section A-A', the diminution of fluorite at this contact must be used as a working assumption. On the geologic section A-A',

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the lower limit of the fluorspar is shown as the contact between the "Upper Member" and "Middle Member" of the Dripping Spring Quartzite Formation. This wording is convenient but is not stratigraphically correct inasmuch as the contact between the two members is stratigraphically above the gray quartzite, at the base of the argillite-hornfels series; the designation is appropriate however, as far as the bottom limit of the ore is concerned.

Drill hole No. 8 has provided a test for the bottom of the ore. It intersected a 5.2 foot silica vein in the massive red quartzite below the No. 1 mine portal. Number 7 drill hole intersected a void near the contact between the gray and red quartzite. The drill holes now in progress, T-11 and T-14, will verify the stratigraphic control to minimize mineralization. If T-11 and T-14 do not intersect minable fluorspar, the working estimate of 350,000 tons of indicated reserve will stand as stated. If either or both holes intersect minable fluorspar, the detailed estimate of 430,252 tons will be strengthened by 20,000 to 40,000 tons, which still keeps a

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working figure of 450,000 tons. The reserve tonnage will still not be "measured" or "proved" until there are sufficient drill holes, sample trenches, or mine workings that approximately 200 foot intervals throughout the fluorspar zone in the vein. This should require 15 to 18 additional holes, but they can be non-core holes drilled at less expense than core holes.

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The confidence limit for indicated tonnage and grade is generally expected to be about 70%. This allows for undetermined waste or thicker ore zones, structural complications, and errors in projection. With the existing indications of good fluorspar mineralization down to the top of the red massive quartzite on the hanging wall (south) side of the vein and with indications that the lithology of the footwall (north) is not so critical, the 70% confidence figure can apply here. Several possible sources of error have been examined, and in this context, the indicated ore could range from 30% high to 30% low or 300,000 to 600,000 tons, depending upon the aggregate conditions turning out less or more favorable in future drilling. The average

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CaF_2 mined grade, by the general 70% confidence figure, could range from 44% to 82%; it is, however, less likely that the average grade for the deposit will reach these limits even under the most extreme conditions. A better confidence figure on grade would be 85%, with the expected average grade at 54% to 72% CaF_2.

A lower-confidence classification, inferred ore, is hard to quantify. There is, as mentioned, the possibility that ore shoots may go deeper than anticipated, into the massive red quartzite. There is also the chance that some of the low grade and thin blocks may improve at shallow depth. These conditions could add 10% to 20% to the ore reserves. There is much stronger possibility that ore extends beyond drill holes T-10, 12, and 14, and beneath the soil cover. The effect of the diabase sill is not clear. In the decline on Site 4 (Figure 5-8) the ore increases slightly in width below the diabase; in the open cut workings on Site 4, however, the diabase did not seem to reduce the width of the ore. Holes T-10 and T-12 penetrated good thicknesses of fluorspar in the quartzite very close to the diabase contact;

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this indicates that the vein was not weakening near the diabase. Inasmuch as the projected upper contact of the red massive quartzite should dip to lower levels to the east, this is a zone of "inferred" ore to a greater depth. If the vein continues for 1000 feet to the east of T-10 at the same or greater bottom depth, this could provide an additional 30% of reserves. Taken with the indicated ore, this would amount to 600,000 tons for the entire deposit. Actually, there is no good reason for limiting the vein at 1000 feet to the east. There is no information.

Prospecting opportunities to the east of proposed T-K, T-L, and T-M holes and sites cannot be stated until the T-K holes are drilled.

4. <u>Tonnage Factor</u>

Ore in the McFadden Peak vein, with 15% wall-rock dilution in mining should average:

63% CaF_2, density 3.

38% SiO_2, $CaCO_3$ and other, density 2.7

(.63)(3.1) + (.38)(2.7) = 2.98 density

2000 ÷ (2.98)(162) = 10.74 Ft^3/ton

Adding 15% for porosity = 12.35 Ft^3/ton

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Practice in similar vein-type fluorspar deposits has been: (Source Allied Chemical Corp.)

Bishop's Cap N.M. at 42% CaF_2, 12 Ft^3/Ton

Animas, N.M. at 50% CaF_2, 12 Ft^3/Ton

Lyda K, N.M. at 47% CaF_2, 13 Ft^3/Ton

Considering the lower grade of the New Mexico veins, a working figure of <u>12.5 Ft^3/Ton</u> is on the conservative side for a calculation of indicated reserves. Porosity of the McFadden Peak ore is not uniformly distributed, the ore ranges from massive (porosity almost zero) to vuggy and crustiform. Weighing of broken spar or density measurements on single massive chunks of spar would not be representative. A more representative tonnage factor can be obtained by weighing several large chunks of spar or measuring the volume of a new advance in the vein, estimating losses in handling fine "sugar" spar at the loading ramp, and recording the weight of spar received from this advance at the mill. This can be done as soon as the underground workings are extended into new ground; workings at the present time are too irregular and are in caved ground involving spar and wallrock.

Exploration

The vein structure continues to the east of hole T-10, but it is entirely under soil cover and untested. The fault structure containing the known vein extends eastward to the Globe-Young highway, but it does not appear to contain fluorspar at that point. The uninvestigated part of the structure amounts to 3000 feet of strike length.

Judging from the increase in easterly dip of beds exposed near T-10, the favorable wallrock should extend to greater depth than in the known area; this increase in dip reflects the presence of the Sierra Ancha monocline. The proposed holes at sites K, L, and M will test the mineralization to the east of T-10 and to a depth of 250 feet or more below the surface. If some of these holes intersect a good width and grade of fluorspar, then the exploration drilling program further to the east will be warranted.

Geophysical and geochemical exploration are not recommended in the area to the east of T-10. Electrical and electromagnetic methods would indicate the position of the structure, but this can be determined well enough from Sites K, L, and M to place additional drill holes. Geochemical work would be of little value in the thick slope wash that covers the vein; groundwater seeps could be sampled for fluorine, but no seeps are known at present.

Geologic exploration for extensions of the McFadden Peak vein to the west toward Tonto Basin and further to the east toward Cherry Creek, will be warranted in the future. This type of exploration, actually prospecting, is not recommended until work is completed on the known deposit.

One final comment on exploration and drilling is needed. Drill core is too important and valuable to leave in its present unprotected location at the property. Drill core is the basis for all decisions on future plans and is a critical element in the review of the property by interested parties or potential partners.

It would be good to ship the core to Phoenix or Tucson for storage in self-service storage lockers. A suitable storage unit would cost $13 to $20 per month, a relatively small cost considering the cost of obtaining the core and the potential damages that can be done by moisture in an open shed.

6. MINING METHODS

As the property is located in a National Forest and approximately 75% of the minable area is visible from State Highway #288, compliance with environmental regulations is magnified.

Regulations state that "all operations must be conducted, so far as feasible, to minimize adverse environmental impacts on the National forests, and take into consideration requirements for meeting Federal, State and local air and water quality standards and solid waste disposal, harmony with scenic values, protection of fish and wildlife habitats, and minimization of road construction damage".

A plan of operations must be filed with the U.S. Forest Service to "show what steps the operator will take for feasible rehabilitation of the area when prospecting or mining is completed". "The plan of operations must be approved by the authorized forest officer before any operations are conducted."

Preliminary contacts with U.S. Forest Service personnel have been amiable and permission was immediately granted to drill diamond drill holes from relatively open drill sites. Twelve additional holes have since been completed after posting a $500 bond. The relationship continues to be favorable for the exploration phase of the project.

The vein is tabular, averaging 5.0 feet in thickness and dips approximately 70° south. It is a strong and persistent structure. The depth of the deposit is variable and ranges from zero on the western end to an unknown horizon at the eastern extremity (within the property end lines).

The ore is blocky and fractures readily. Generally, voids or fault gouge form the contact with foot and hanging walls allowing the vein material to fall of its own weight when undercut.

A combination of surface and underground mining is proposed for maximum ore extraction.

Surface Proposals

The potential surface mining areas consist of the two extremities of the deposit and are designated as "Western Sector" and "Eastern Sector", respectively.

Underground Proposals

The potential underground mining area is comprised of the central zone and is designated as "West Central" and "East Central", respectively.

Surface Mining

1. The Western Sector extends from Coordinate 4900-E to Coordinate 5500-E where the deposit is shallow and it is considered impractical and too costly to extend the underground level 600' and then drive necessary extraction raises in waste to capture the estimated 12,012 tons of minable ore.

The Western Sector has an average width of approximately 3.3 feet. This vein width does not lend itself to open pit mining methods. A minimum bottom width of 20 feet would have to be mined. When waste material in the slopes is added, waste/ore ratios could approach 30 to 1. In this area, all material, both waste and ore, would have to be drilled and blasted.

For the above reasons, the small tonnage of ore in this sector is not considered to be economical for mining by either open pit or underground methods.

2. The Eastern Sector extends eastward from Coordinate 10880-E to the limits of the vein or property line, whichever occurs first. A study of diamond drill cores, particularly for drill hole Nos. T-10, T-12 and T-14, and the possibility of ore blocks eastward from WN-8 and WN-9 revealed that the incompetent hanging wall diabase and underlying fractured quartzites may be stripped to expose and mine the steeply

dipping fluorspar vein to elevation 5690' or below.

Overburden Removal

To facilitate the underground mining of the Central Zone it will be necessary to strip the overburden and expose the vein in areas:

Coordinate 8500-E to Coordinate 9000-E

Coordinate 9470-E to Coordinate 10500-E

In addition, there are two areas where prior surface mining extracted the vein only and subsequent sloughing has covered the outcrop with loose material from the hanging and foot walls. These are:

Coordinate 8000-E to Coordinate 8500-E

Coordinate 9200-E to Coordinate 9470-E

Eastern Sector - Preliminary Pit Design

1. Design Criteria

   A. Ore - Based on the ore intersection in drill hole T-10, the bottom of the ore horizon was assumed at 5690 elevation for pit design purposes. Since no information is presently available east of T-10, a constant horizontal 10 foot vein width was assumed in projecting

the vein to the east. The top ore horizon has been assumed to be at 5830 average elevation.

The vein was projected due east to 11500-E coordinate at the 5690 elevation. This is approximately 555 feet east of drill hole T-10.

B. Pit Design - To provide minimum working room in the bottom of the pit, the 5690 level was laid out with a width of 25 feet. This makes the footwall of the vein as the north limit, the south limit being 15 feet into the quartzite waste, assuming a 10 foot vein width as stated above.

All pit slopes have been generated upwards from the 5690 bottom elevation at 45 degrees.

A 10% haul road, 35 feet wide, has been designed from the east end of the 5690 level exiting the pit on the south side at approximately 5750 elevation. This haul road will serve for the ore haul to the mill site and for waste removal below 5740 elevation.

C. Tonnage Calculations - The designed pit was planimetered in 20 foot horizontal increments, as shown in Figure 6-1 , Preliminary Pit Design, East End. Total tonnage for each 20 foot increment was calculated using a factor of 12.5 cubic feet per ton of material in place.

Ore tonnages were calculated by assuming a 10 foot average width of vein and multiplying by the length applicable to each elevation, on the assumption the ore uncovered in the pit slopes on each end would be mined, and multiplying by the 10 foot or 20 foot height applicable for each bench. Ore was also considered to have a factor of 12.5 cubic feet per ton.

Total pit tons by levels are shown in Table 6-1 , and Table 6-2 depicts ore tonnage by levels. Table 6-3 is a combined summary of ore, waste and total tons.

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Overall waste ore ratio was calculated to be 22.67 tons waste to one ton of ore.

2. Mining Methods

A. Stripping - Based on information presently available, it has been assumed that it will be possible to mine the waste by ripping the material with a D-9 or equivalent dozer-ripper followed by scrapers for removal of the ripped waste.

B. Ore Mining - It is planned to load the ore with a front end loader. A 3-1/2 to 5 cubic yard loader would have ample capacity and be able to satisfactorily load 25 ton end dump haulage trucks. With a 280 tons per day requirement for ore, one operating truck on a one-shift per day basis will be adequate for ore haulage, provided a spare truck is on the property, in the event of breakdowns.

In stripping the waste with scrapers, once the ore horizon has been reached, the waste should be cleaned from the hanging wall side of the vein to a depth of approximately 5 feet below the top of the vein. The ore would then be ripped if necessary, loaded and hauled out. This would be followed by removing the footwall

waste down to the top of the ore. The same procedure would be followed for each subsequent 5 foot depth of ore in the vein. This method should result in minimum dilution and virtually 100% recovery of the ore. Pre-production stripping required is approximately 309,000 tons from the surface down to the 5830 elevation.

TABLE 6-1

TOTAL TONNAGE CALCULATIONS

Level	Sq. In.	Mean	Ht.	X	Cu.Ft.	÷	Tons
5923	0						
		.38	23	10,000	87,400	12.5	6,990
5900	.38						
		.85	20	"	170,000	"	13,600
5880	1.32						
		.07	3	"	2,100	"	170
5880	.14						
		3.15	20	"	630,000	"	50,400
5860	4.58						
		.63	13	"	81,900	"	6,550
5860	1.26						
		8.05	20	"	1,610,000	"	128,800
5840	10.26						
		12.65	20	"	2,530,000	"	202,400
5800	18.84						
		18.92	20	"	3,784,000	"	302,720
5780	19.00						
		16.82	20	"	3,364,000	"	269,120
5760	14.64						
		12.38	20	"	2,476,000	"	198,080

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(Cont.)

Level	Sq. In.	Mean	Ht.	X	Cu. Ft.	÷	Tons
5740	10.12						
		8.45	20	10,000	1,690,000	12.5	135,200
5720	6.78						
		4.93	20	"	986,000	"	78,880
5700	3.08						
		2.23	10	"	223,000	"	17,840
5690	1.38						
				TOTAL TONS			1,681,790

TABLE 6-2

ORE TONNAGE CALCULATIONS

Level	Length	Ht.	Width	Cu. Ft.	÷	Tons
5690	565'	10	10	56,500	12.5	4,520
5700	585'	20	10	117,000		9,360
5720	605'	20	10	121,000		9,680
5740	625'	20	10	125,000		10,000
5760	645'	20	10	129,000		10,320
5780	665'	20	10	133,000		10,640
5800	685	20	10	137,000		10,960
5820	695	10	10	69,500		5,560
				TOTAL ORE TONS		71,040

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TABLE 6-3

SUMMARY

TONNAGES BY LEVELS

Level	Tons Ore	Tons Waste	Total Tons	Accumulated Total Tons
5900	--	6,990	6,990	6,990
5880	--	13,770	13,770	20,760
5860	--	56,950	56,950	77,710
5840	--	128,800	128,800	206,510
5820	5,560	196,840	202,400	408,910
5800	10,960	260,080	271,040	679,950
5780	10,640	292,080	302,720	982,670
5760	10,320	258,800	269,120	1,251,790
5740	10,000	188,080	198,080	1,449,870
5720	9,680	125,520	135,200	1,585,080
5700	9,360	69,520	78,880	1,663,950
5690	4,520	13,320	17,840	1,681,790
TOTALS	71,040	1,610,750	1,681,790	1,681,790

Waste Ore Ratio - $\frac{1,610,750}{71,040}$ = 22.67 to 1

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3. Equipment

A. Dozer - Rippers -- Consider D-9's

Ripping capacity - D-9 single shank ripper

Ripping distance 300 ft.

Time/pass at 1 mph (88 fpm):

$$\frac{300}{88} = 3.41 \text{ min.} + .25 \text{ min (turn time)} = 3.66 \text{ min.}$$

Working time/shift = 50 min/hr. x 7 hrs. = 350 min.

$$\frac{350 \text{ min.}}{3.66 \text{ min.}} = 96.6 \text{ passes/shift}$$

$$\text{Volume ripped} = \frac{3 \text{ ft. spacing} \times 2 \text{ ft. depth} \times 300 \text{ ft.}}{22}$$

= 66.7 cubic yards per pass

66.7 x 96.6 passes = 6,443 cu. yd./shift (theoretical)

Assume 87.5% actual 6,443 x .875 = 5,637 cu. yd./shift

$$5{,}637 \times \frac{27}{12.5 \text{ c.ft./ton}} = 12{,}175 \text{ tons/shift}$$

B. Scrapers - Assume 631 D (31 cu. yd. scrapers)

Use 25 cu. yd. average load

1600 ft. one-way average haul distance

Loading time	0.7 min. (with D-9 pusher)
Dump time	0.7 min.
Loaded haul	1.5 min.
Return empty	1.3 min.
	4.2 min. Total cycle time

$\frac{350 \text{ min. shift}}{4.2 \text{ min.}}$ = 83 loads/scraper shift

83 x 25 cu. yd. = 2,075 ripped cu. yd./shift

$\frac{2{,}075 \text{ cu. yd.}}{1.33 \text{ swell factor}}$ = 1,560 B. cu. yd./shift -

Use 1500 B. cu. yd.

3 scrapers x 1,500 = 4,500 B. cu. yd./shift capacity/shift

3 scrapers will require one D-9 dozer as a pusher to load the scrapers.

Ripper capacity from above - 5,637 B. cu.yd./shift

3 scrapers = 4,500 B. cu.yd./shift

Therefore: Total equipment needed for waste removal is as follows:

1 D-9 dozer ripper

1 D-9 dozer ripper as a pusher

3 631-D scrapers

C. Ore mine and haul equipment -

1 966C front end loader

1 25-ton end dump truck (plus 1 spare)

4. Pit Operating Costs

A. General - Due to the short life of the operations, it is felt that the most economical approach would be to contract the pit mining operation.

B. Operating Costs - Waste Removal

Equipment: 3 631D scrapers (31 cu.yd. capacity

2 D-9 dozer-rippers

3 631D scrapers @ $270/shift =	$ 810/shift
2 D9 dozers @ $275/shift =	550/shift
Total equipment operating cost	$1,360/shift
Add 25% for contractor depreciation	340/shift
Contractor field supervision	100/shift
Add 25% for overhead & profit	450/shift
TOTAL	$2,250
Add 15% contingency	338
TOTAL WASTE COST/SHIFT	$2,588

Total tons/shift = 4,500 [illegible] = 9,720 tons

$2,588.00 cost/shift / 9,720 tons = $0.26.6/ton [illegible] 26.7¢

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C. Ore Mine & Haul -

Equipment: 1 966C loader @	$132.00/shift
1 35-ton truck @	188.00/shift
Total equipment operating cost	$320.00/shift
Add 25% contractor depreciation	80.00/shift
Add 25% contractor overhead & profit	100.00/shift

(Cont.)

Add 15% contingency	$ 75.00/shift
Owner field supervision - ore control	100.00/shift
TOTAL	$ 675.00

$$\frac{\$675.00}{280 \text{ tons ore/shift}} = \$2.41/\text{ton of ore}$$

Total cost/ton of ore:

22.67 tons waste x 26.7¢ =	$ 6.05/ton of ore
Ore mine and haul =	2.41/ton of ore
Total cost/ton of ore mined	$ 8.46

If preproduction stripping costs are charged to development, mining costs/ton of ore after pre-stripping will be as follows:

Total waste to be mined	1,610,750 tons
Less preproduction stripping	307,710 tons
	1,303,040 tons

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$$\frac{1{,}303{,}040}{71{,}040} = 18.34 \text{ tons waste to 1 ton ore}$$

Mining cost after preproduction stripping:

Waste cost = 18.34 x 0.267 =	$ 4.90
Ore mine and haul =	2.41
	$ 7.31/ton of ore

D. Other Development Costs - Prior to starting the pit stripping operation, all of the surface area that will be encompasses in the pit as well as those areas to be used for waste disposal will have to be cleared of trees and underbrush. The total area involved is approximately 12.5 acres. In addition, a drainage ditch will have to be established on the north side of the pit area to divert surface runoff from the pit area.

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The cost of this work has been estimated on a lump sum basis at $150,000. There may be some salvageable timber that could be credited to this cost; however, no value has been placed on this item.

E. Reclamation Costs - It is assumed that all waste material removed from the pit will have to be rehandled and placed back in the excavated area, followed by reforestation. If this be the case, total reclamation cost, exclusive of mill tailings, is estimated at $450,000.

Underground Mining

Estimated ore reserves of the central sector of the deposit, extending from Coordinate 5500-E to Coordinate 10880-E total 424,600 tons. The vein occurs in competent host rocks and the vertical dimension of the vein in a major portion of this zone is such that it would mean unfavorable waste to ore ratios for surface extraction. Drilling and blasting for removal of the wallrock to expose the spar would be costly. Underground mining is therefore planned for this zone. It is divided into two separate areas.

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1. West Central

This sector extends from the existing drift portal at Coordinate 7450-E to Coordinate 5500-E and ore reserves are estimated to total 113,900 tons, not including tonnage extracted by Western Fluorspar. Minable ore excluding pillars totals 90,000 tons.

2. East Central

This sector extends from Coordinate 7450-E to Coordinate 10880-E and is estimated to have reserves of 310,700 tons. Minable ore excluding pillars totals approximately 290,000 tons.

This portion of the deposit would be mined after strip mining is completed. It would be extracted through an access drift collared approximately 3400 feet east of the existing mine portal, at Coordinate 10880-E and an approximate elevation of 5740'.

The plan obviates the proposed adit at 9460-E and 10,000-N as outlined in the Preliminary Report, October 1978, and reduces the capital and preproduction costs accordingly.

Underground Method

The underground method selected for all underground mining is underhand bench with draw point loading. This method is illustrated in Figure 5-3 and 6-2, Proposed Underground Mining with Topography, and Figure 6-3, Typical Stope Development and Mining.

Deciding factors in selecting the method were:

Maximum ground control

Minimum dilution

No underground inventory of ore required

Minimum stope preparation and chute construction

Safety considerations

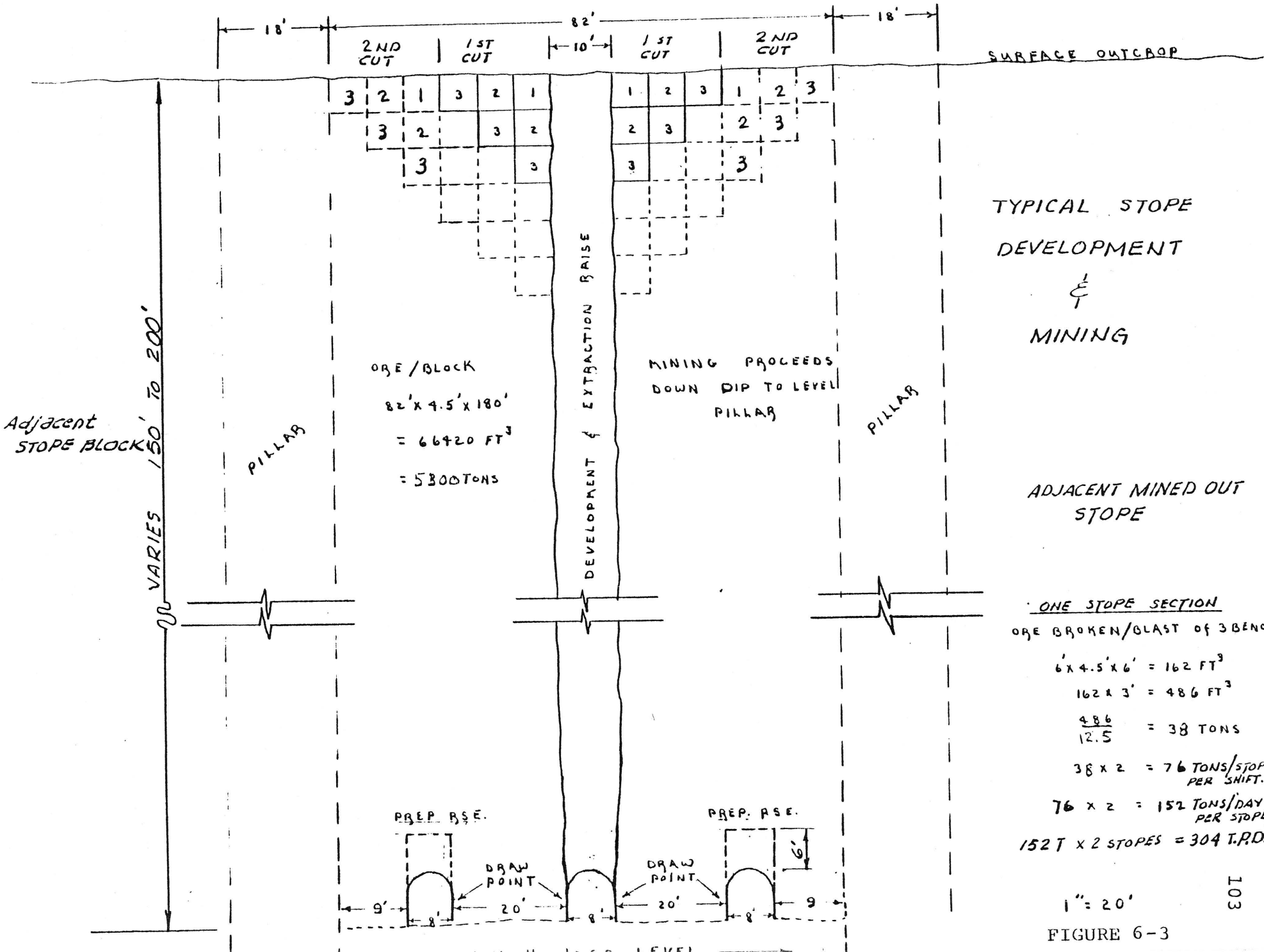
18'
82'
18'
2ND CUT
1ST CUT
10'
1ST CUT
2ND CUT
SURFACE OUTCROP
TYPICAL STOPE DEVELOPMENT & MINING
Adjacent STOPE BLOCK
VARIES 150' TO 200'
PILLAR
ORE/BLOCK
82'x 4.5'x 180'
= 66420 FT³
= 5300 TONS
DEVELOPMENT & EXTRACTION RAISE
MINING PROCEEDS DOWN DIP TO LEVEL PILLAR
PILLAR
ADJACENT MINED OUT STOPE
ONE STOPE SECTION
ORE BROKEN/BLAST OF 3 BENC
6'x 4.5'x 6' = 162 FT³
162 x 3' = 486 FT³
486/12.5 = 38 TONS
38 x 2 = 76 TONS/STOP PER SHIFT.
76 x 2 = 152 TONS/DAY PER STOPE
152 T x 2 STOPES = 304 T.P.D.
PREP. RSE.
PREP. RSE.
DRAW POINT
DRAW POINT
9'
8'
20'
8'
20'
8'
9
6'
1" = 20'

FIGURE 6-3

As part of the mine layout, an estimate of the stope widths and pillar widths was required for determining minable ore reserves and costing out underground mining. For this initial stage of mine design and ore reserve calculations, stope widths of 82 ft. and pillar widths of 18 ft. should be feasible. To help reduce dilution and prevent loose rock from falling, rock bolting and wire mesh of the hanging wall should be considered. Each pillar should be oriented with its long axis down the dip of the vein and continuous because of the high frequency and low shear strength of geologic structures parallel to the vein.

A complete rock mechanics study was not considered necessary at this stage in the project. If feasibility is established, a rock testing program should be made, and stope widths and pillar dimensions should be re-evaluated. (See Appendix, Preliminary Rock Mechanics Study).

The underground mining method is described as follows:

> The vein is divided into ore blocks 100' long along the strike and extending from the working level to surface, or the level above, as the case may be. This block length is based on the preliminary rock mechanics study.

The main haulage drift is driven in the footwall leaving an approximate pillar width of 20 feet between the footwall and haulage drift.

Block development for each stope section consists of a draw point turnout, driven at an angle from the haulage drift to the hanging wall of the vein to facilitate loading, at the block center line. A development and extraction raise is then driven on ore from the face of the crosscut to surface following the centerline of the ore block. Two additional draw point turnouts are driven to the vein hanging wall east and west of the center crosscut on 26' centers leaving 18' pillars between.

Extraction raises from these adjacent draw points are driven on the vein for a distance of 6 feet above the back of the draw point turnout crosscut.

After the development raise is connected to surface, or the level above, and the raise stripped of timber and air and water lines, underhand benching commences on the vein, adjacent to the raise opening. Each bench is carried six feet along the vein and six feet down dip. The initial blast consists of one cut to form the first

bench each side of the central raise. These benches are cleaned off after the blast by mucking the residual broken ore into the central raise. Drilling continues at the surface as before and on each bench maintaining the six foot dimension for each round. After blasting, two benches are cleaned into the central raise, the uppermost bench being mucked off first so drilling can commence as soon as the third surface round is completed. All three rounds are now blasted and mucked into the central raise. The three benches each side (six in all) are carried down dip until the extraction raises, east and west of the central raise, are exposed thereby forming three extraction openings. The crew then moves back to the surface and repeats the procedure, leaving an open stope 82' wide bounded by the 18 foot vertical pillars to the east and west when completed.

After each blast, the hanging and footwall are scaled and ground support placed if required, be it rock bolts, timber stulls with headboards, or some combination of bolts and cyclone fencing. In this manner, the walls are made safe before the crew blasts another series of benches. Blast holes are drilled in the ore only using the exposed bench face as a guide.

If a second lift is to be removed, it will be necessary to bulkhead the vein opening above the level elevation before stoping operations are conducted below.

The above described procedure is followed for each block in succession until all "block-ore" is extracted. The salvage operation follows and may recover 45% of the pillars.

Ventilation

Ventilation must be adequate in all development and stoping areas, with special attention to those areas where diesel equipment is utilized.

Ventilation intake will be through the main haulage drift in the west central sector with exhaust to surface through the active stopes and designated exhaust raises.

Intake for the east central sector will be through the east haulage drift with exhaust to surface through active stopes and designated exhaust raises.

Electric axivane fans will provide ventilation for development headings.

Production Requirements

	Tons
Annual milling rate	70,000
Daily milling rate	200
Daily mining rate	280 (250 days)

West Central Sector

Initial underground production will come from the west central sector where stope blocks can be developed by advancing the existing drift and driving the necessary block development raises to surface.

This production will be trammed by battery locomotive to the portal ore bins and by truck to the mill.

Rehabilitation of the existing drift and track will be required to assure efficient tramming before preproduction development and stope preparation can be started. This is estimated to take 2 to 3 weeks.

The west central sector ore reserves, above the drift elevation, total approximately 85,000 tons of minable ore, sufficient for a one year operation. The daily tonnage will be produced from two operating stopes plus the modest production

generated by development and stope preparation work, principally raising.

The average stope block contains approximately 5,400 tons and will be in production about 1.6 months, allowing for downtime, after block development and preparation are completed. At this rate, disregarding development and preparation ore, it will be necessary to complete the development and preparation work required to provide a replacement stope every 30 day working period.

Stope Development Totals

			Advance/Day
Drifting	=	100' ÷ 30	3.3'
Turnouts (3)	=	66' ÷ 30	2.2'
Raising	=	175' avg. ÷ 30	5.8'
			11.3'

Stope Preparation Totals

Prep raises	=	12' (two at 6')	2 shifts required to complete

To ensure uninterrupted stope ore production allowing for unscheduled downtime, it will be necessary to have at least three stopes in the production cycle at all times. Therefore, preproduction development and stope preparation is required as follows:

Stope Development

Drifting	350'
Raising	525'

Stope Preparation

Raises	36'

East Central Sector

The bulk of the ore reserves lie in the east central sector and extends from Coordinate 7480-E to 10880-E. Vertically, the ore extends from elevation 5740' to elevation 5950' (as presently known). Minable ore totals 250,000 tons and will be mined by the underhand bench method as in the west central sector.

Development of the east central sector is scheduled to start after pit production is completed or operations have shifted eastward sufficiently to allow both projects to proceed without interference.

Costs

The following tables summarize the preproduction development cost, capital cost and operating cost for the west central and east central sectors: 6-4, 6-5, 6-6, 6-7 and 6-8.

TABLE 6-4

PREPRODUCTION DEVELOPMENT COST
EAST CENTRAL SECTOR

Underground	
Haulage level drift (8'x8') x 300' x $100/ft.	$ 30,000
Draw point (8'x8') 3 x 25' x 3 x $100/ft.	22,500
Raises (5'x10') x 180' x 3 x $120/ft.	64,800
Prep. raises (5'x8') x 6' x 6' x $100/ft.	3,600
Vent raise 150' x $120/ft.	18,000
	$ 138,900
Utilities	
Power	$ 5,000
	$ 144,900
15% Contingency	22,910
TOTAL	$ 171,810

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TABLE 6-5

PREPRODUCTION DEVELOPMENT COST
WEST CENTRAL SECTOR

Environmental	
Plan of operation and approval	$ 5,000
Access Roads	
Includes reconditioning of existing roads	5,000
Personnel	
Acquisition and training	5,000
Engineering & Technical Services	18,000
	$ 33,000
WEST CENTRAL SECTOR	
Surface	
Recondition mine patio area	$ 500
Reconstruct ore and waste trestle	5,000
Level area outside mine portal	200
	$ 5,700
Underground Preproduction	
Recondition & repair main haulage drive	$ 2,000
Revise air and water lines	200

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Survey of drifts & cuts & accessible stopes and prepare maps & sections	$ 2,500
Drive footwall haulage & turnouts 530' @ $100/ft.	53,000
	$ 57,700
Drive development raises 3 x 150' @ $120/ft. (Drive simultaneously with drifting)	$ 54,000
Drive stope preparation raises 6' x 6' @ $100/ft. (Drive simultaneously with hand and development rec.)	3,600
	$115,300
Total West Central Sector	$154,300
15% Contingency	23,145
	$177,445

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TABLE 6-6

DIRECT MINING COST - SUMMARY

	$/Ton
Development (labor, maint. and supp.)	3.30
Preparation (labor, maint. and supp.)	1.87
Ore breaking (labor)	4.12
Haulage (labor)	0.75
Loading (labor)	0.48
Pipe and track and vent. (labor)	0.47
15% contingency on labor	1.65
	8.73
Maint. and supplies @ $2.35/ton	2.35
TOTAL	11.08

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TABLE 6-7

CAPITAL EXPENDITURES -
EAST CENTRAL SECTOR

Buildings		
Compressor shed		
Generator shed		
Shop building (temporary)		
Office (move from West Central Sector)		
Sanitation (includes septic tank)	$6,500	
Water tanks (2 - includes pipe)	2,000	
		$ 8,500
Equipment		
Compressor 900 cpm (used)	35,000	
Generator 50 kva (new)	15,000	
Vent fans (2 - used)	3,000	
Rocker shovels (from West Central Sector)	---	
Rock drills (from West Central Sector):		
Sinkers (2-new)	3,100	
Stopers (1-new)	2,050	
Locomotive - used Mancha 1 1/2 ton	6,500	
Air receiver	2,500	
		$ 67,150
		$ 65,650
15% Contingency		9,848
		$ 75,498

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TABLE 6-8

CAPITAL EXPENDITURES - WEST CENTRAL SECTOR

Buildings		
Office	$ 5,000	
Shop	5,000	
Compressor shed	1,500	
Generator shed	1,500	
Electrical (battery chrg. etc.)	2,000	
Sanitation	1,000	
Powder magazine	1,000	
		$ 17,000
Equipment		
Compressor (used)	35,000	
Rocker shovels (2-used 12B)	9,000	
Mine cars (8-used)	2,000	
Mine lamps & safety equip. (new)	4,000	
Generator 50 KVA (new)	15,000	
Rock drills (feed leg)	5,460	
Rock drills (sinkers - 5)	7,750	
Rock drills (stopers - 3)	6,150	
Air receiver	2,500	
Fans, vent. (3 - used)	4,500	
Used locomotive (Mancha 1 1/2 ton)	6,500	

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Water Supply

Tank (1 on site)	$ 500	
Pumps (well and surface)	5,000	
		$ 103,360
TOTAL WEST CENTRAL SECTOR		$ 120,360
15% Contingency		18,054
		$ 138,414

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Operating Cost

Labor:

Surface -	$/Shift	
Topman (1 - day shift only)	70.20	$ 70.20
Maintenance - Day shift only		
Electrician (Lampman) (1) 8.00/hr. + 35% Fr.	86.40	
Mechanic (Drill Doctor) (1) 8.00/hr. + 35% Fr.	86.40	
		$172.80

Underground -

	No./Shift Stope	No./Shift Dev.	Total/ Shift	No.Shift/Day Stope	No.Shift/Day Dev.	No. Day	Wage Hr.	Wage/ Day W/Fr.	Total Cost/ Day
Miner	4	1	5	2	1	9	8.00	86.40	777.60
Helper	4	1	5	2	1	9	6.50	70.20	631.80
Motorman			1			2	7.00	75.50	151.00
Swamper			1			2	6.50	70.20	140.40
Shovel Oper.			1			2	7.00	75.50	151.00
Pipe & Track			1			1	7.00	75.50	75.50
Helper			1			1	6.50	70.20	70.20
				Surface =		26 + 3			
Man Shifts/Day						29			$1997.50
Total labor cost/day									$2140.50

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Manpower

Current wages for underground mining personnel plus fringe benefits of 35%, coupled with a production rate of 280 tpd, make mining costs extremely labor sensitive. For example, the addition of one worker to the daily expenditures can affect the mining cost per ton approximately $0.30. It therefore, behooves mine management personnel to be cost and productivity conscious; each man must perform a full shift's work. The estimated manpower is the minimum required to produce 280 tons per day and supervision must insist on a productivity no less than 10 tons per man shift to meet this goal.

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Mine administrative costs also have considerable impact and supervisory personnel must be limited to one man per shift. It is preferred that the day shift be supervised by the mine superintendent with a shift boss supervising the second shift. The number of employees per shift is not excessive (15) and each working place may be visited, at least twice per shift.

A manager and/or mechanical-electrical superintendent cannot be supported full-time; therefore, some arrangement must be found to charge a part of these salaries to other projects where such services can be utilized.

Duties

1. Development Crews

   A. Muck out with service only from motor crew

   B. Drill and blast - (transport explosives to working face)

   C. Work two faces whenever possible:

      Main heading

      Turnout or raise

   D. Drive development and prep. raises:

      Development raise

      Prep. raise

      Install raise timber

2. Stope Crews (2 crews/shift, each crew 2 miners & 2 muckers)

   A. Strip timber from development raise

   B. Drill and blast

   C. Muck off benches

   D. Install necessary timber and roof bolts

   E. Drive prep. raises when required (12'/stope block)

   F. Transport explosives and supplies to working face

3. Motor Crews (2 men/shift)

   A. Supply development crews with cars as required

   B. Supply loader operator (draw points) with cars as required

C. Move supply trucks from patio to underground timber or supply stations as required.

D. Place and remove batteries on/from charging racks.

4. Pipe and Track Crews (2 men/day shift only)

A. Install track in development heading (haulage)

B. Install track in turnouts to draw points

C. Transport track as required in headings

D. Transport ties and other supplies as needed

E. Install pipe as required

F. Install vent tube as required

5. Topman (1 man/1 shift)

A. Receive and dispatch supplies - place supplies in supply room

B. Move explosives from surface magazine to powder car and unload at underground magazine

C. Break boulders on grizzly when required

D. Perform other odd jobs as directed by shift boss

6. Mechanic (1 man/day shift only)

A. Maintain rock drills, feed legs and stopers as required, in operating condition

B. Maintain haulage equipment

C. Maintain rocker shovels

D. Maintain mechanical elements of battery locomotives and fans

E. Maintain compressors, mechanical elements of generator sets, pumps

F. Maintain company vehicles

G. Repair chute gates, etc., as required

7. Electrician (1 day shift only)

A. Attend and maintain mine lamp charging

B. Install and maintain surface and underground lighting and fan circuits

C. Install and maintain mine fans

D. Maintain generators

E. Maintain electrical circuits

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7. METALLURGICAL STUDY

Objective

The objective of the metallurgical investigation is to develop the most economical processing scheme with the flexibility to produce both the acid grade fluorspar and metallurgical grade fluorspar as market conditions require. To accomplish this, bench scale tests were carried out and a production run on the Western Fluorspar ore at the Tonto Basin mill was observed. From this data along with hands-on experience of the PAH staff, flotation and gravity concentrating methods were evaluated.

In order to fully evaluate the economics of the milling phase, it was necessary to study the freight rates and market requirements as well as possible mill sites.

From this data, a metallurgical flowsheet has been developed for a flotation concentrator and a combination of heavy media separation followed by flotation. Four economic considerations have been developed including milling at the plant site and use of the Tonto Basin milling facility on a purchased arrangement.

Ore Characteristics

The Western Fluorspar ore is premium quality both as to the percent of calcium fluoride and as to the amenability to various types of concentration. The calcium fluoride mineral is in the form of a massive crystalline structure. The associated silica is not finely dispersed or tightly interlocked with the calcium fluoride. Because of the relationship of fluoride to silica, fine grinding is not required to liberate gangue from the mineral. The ore is amenable to both heavy media concentration and froth flotation. Both of these concentrating methods have been considered separately and as combined processes.

The recovery and product grade resulting from these processes are summarized in Table 7-1. This data was generated from batch testing and in-plant testing of a 380 ton ore lot at Tonto Basin mill. Test results are shown in Tables 7-2 and 7-3. Based on these results, it is believed that only froth flotation or a combination of heavy media separation and froth flotation should be considered. Since the fines in metallurgical grade fluorspar are limited to about 10% -1/4", approximately 14% of the ore would be rejected prior to heavy media separation. This would cause the recovery of calcium fluoride to be approximately 73%. Therefore, heavy media separation alone would result in extremely low recovery values.

Table 7-1

CaF_2 RECOVERY

Concentrating Method	CaF_2 Recovery % of Total	Product Grade % of CaF_2
Froth Flotation	87%	97%
Heavy Media on +8 mesh	73%	90% (79% EU)
Heavy Media and Froth Flotation	87%	97%

Table 7-2

TONTO BASIN MINING & MILLING
WESTERN FLUORSPAR ORE

MILL OPERATING RESULTS
July 18-25, 1978

					ASSAYS									
					HEADS			CONCT.			TAILS			
DATE	SHIFT	FEED TONS	CONCT. TONS	TAILS TONS	CaF_2	SiO_2	$CaCO_3$	CaF_2	SiO_2	$CaCO_3$	CaF_2	SiO_2	$CaCO_3$	PERCENT RECOVERY
7-18	2	46.28	24.116	22.172	61.0	28.55	3.7	98.2	0.88	0.28	20.4		5.3	83.8
7-19	1	35.96	20.856	15.102	56.3	27.30	3.3	97.7	1.05	0.43	11.1		5.0	92.4
7-19	2	35.54	17.70	17.84	58.0	30.50	3.7	98.2	0.90	0.30	18.1		2.7	84.3
7-20	1	32.03	16.43	15.60	57.2	30.95	3.7	98.0	0.96	0.30	14.3		5.3	87.9
7-20	2	40.39	20.76	19.63	55.6	33.56	3.3	97.4	1.41	0.38	11.4		5.0	90.0
7-21	1	36.60	20.82	15.78	59.0	31.14	2.3	97.8	1.15	0.35	11.7		4.3	91.0
7-21	2	34.10	16.98	17.12	55.0	36.65	2.0	97.9	1.05	0.28	12.4		2.7	88.6
7-24	1	35.12	17.24	17.87	55.5	34.86	2.0	98.0	1.02	0.30	14.5		4.0	86.7
7-24	2	22.52	10.22	12.30	51.6	38.91	2.0	97.6	1.13	0.28	13.4		3.3	85.9
		NUMERICAL AVERAGE			56.58	32.49	2.88	97.87	1.06	0.32	14.14		4.17	87.36
TOTAL		318.54	165.120	153.41										

Recovery based on numerical average CaF_2 analysis of products using formula $\frac{100C\ (H-T)}{H(C-T)}$ =

$$\frac{97.87\ (56.58 - 14.14)}{56.58\ (92.87 - 14.4)} = \frac{4125}{4722} = 87.36$$

ACID GRADE SPEC - 97.5 CaF_2, LESS THAN 1.1 SiO_2, 50% -200 MESH.
AVERAGE TPH 5.1 - 100 HP 6 x 6 MARCY-GRATE DISCH.

Table 7-3

HEAVY LIQUID TESTS

McFadden Peak Fluorspar Ore

	Wt. Grams	Wt. %	% CaF_2	% S_1O_2	Percent Dist. CaF_2 Products	Dist. CaF_2 Of Total
Product:						
-3/4" sample	27,610	100	50.85		100	100
-3/4" + 1/4"	19,800	71.71	47.89		67.53	67.53
-1/4" + 8 mesh	3,870	14.02	59.41		16.38	16.38
- 8 mesh	3,940	14.27	57.36		16.09	16.09
Heavy Liquid Test:						
-3/4" + 1/4"	2,056	100	47.83		100	67.53
Sink	960	46.69	89.60	6.00	87.46	59.06
Float	1,096	53.31	11.25	75.00	12.54	8.47
-1/4" +8 mesh	1,334	100	59.37		100	16.38
Sink	756	56.67	91.00	2.60	86.80	14.22
Float	578	43.33	18.10		13.20	2.16

Heavy Liquid
Acetylene Tetra Bromide
SPG = 2.964

The Western market for fluorspar requires that both acid grade and metallurgical grade fluorspar be produced. This can be accomplished by processing all the ore through flotation and pelletizing part of the concentrate or taking a coarse heavy media product. Considering the variety of specifications for metallurgical grade fluorspar, it would appear most practical to pelletize the flotation concentrate. In this process, the flotation concentrate would be blended with lime to adjust the grade downward. With this controlled dilution, the top price per unit of calcium fluoride could be realized. For instance, U.S. Steel at Provo will contract for metallurgical grade fluorspar at 70% effective units with no premium if it exceeds 70%. There is, however, a severe penalty for any product that falls under 70%. It would be quite difficult to control a heavy media product to a point of where 70% effective units would be maintained continuously without literally giving some fluorspar away.*

Present Milling Practice

The Western Fluorspar ore from the McFadden Peak mine is hauled 50 miles to the Tonto Basin mill at Punkin Center, Arizona. This haul road includes 18 miles of graded road across Highway 288 and 31 miles of very rough road with curves and dips designated as Route 60. The present trucking rate is

*Effective units equals percent CaF_2 minus 2.5 x percent SiO_2

$6.00/ton of ore; however, it is not believed that this rate could be sustained for a larger tonnage operation. The present truck operator is reportedly not able to meet his obligations for this $6.00/ton.

The Tonto Basin mill is located on approximately 45 acres of land on the northwest side of Roosevelt Lake. This site is relatively flat and there is ample water and tailings disposal area. The mill circuit consists of crushing, grinding, flotation, filtration and drying to produce an acid grade fluorspar containing 97% CaF_2. It is a very straight-forward circuit and does not use heated pulp or extensive mill water treatment. Mill capacity is reported to be over 100 tons per day of ore. However, from our observations, the mill did not have sufficient ore feed to really tax the capacity. During our observation period, 380 tons of McFadden Peak ore was processed through the plant with very little difficulty in maintaining grade with recoveries averaging +85%.

The mill is kept in excellent condition and they have not encountered any known environmental problems. Considering the availability of power and water and the haul to Mesa for shipment of product, the mill is in an excellent location. However, from the standpoint of processing the McFadden Peak ore at 200 tpd, the mill has two disadvantages. One: it is

believed that a haul rate of $8.00/ton is more realistic for hauling the ore from McFadden Peak to Tonto Basin. With the concentration ratio of approximately 50%, this would add $16/ton to the product cost as compared to approximately $7.81 per ton for haulage of product from the mine site to the rail head in Mesa. Second: the mill would have to be expanded to take the full 200 tpd of ore feed. This would require duplication of some of the process equipment and probably result in higher operating costs as compared to a new 200 tpd mill. To offset these two disadvantages, preconcentration of the ore at the mine site by heavy media separation was studied. By crushing and preconcentrating the +1/4" ore by heavy media separation, the flotation mill feed could be reduced by 70 tpd on a 200 tpd basis. This would decrease the tons of waste being hauled to Tonto Basin from the mill site and more closely match the Tonto Basin crushing and grinding capacity. Even with these considerations, the Tonto Basin mill will not yield the projected profit potential of an on-site facility. These economic considerations are futher developed in the following sections of this report.

TO BE READ AND EVALUATED IN CONJUNCTION WITH P.A.H. ADDENDUM I, MARCH 1979 WHICH IS AN INTEGRAL PART OF THIS DOCUMENT.
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Milling Capital and Operating Costs

Capital and operating costs for four different mill plans are summarized in Tables 7-4 and 7-5 with the detail cost shown in Tables 7-6 and 7-7. These tables show Alternate I,

installation of a 200 tpd flotation plant at the mine site, is the second highest capital cost with the lowest corresponding operating cost. It should be noted that the capital cost for this alternate is based on acquiring the mill claims at the mine site which are not presently in the Triangle Mining-Western Fluorspar lease. Also, it is assumed that sufficient water can be developed on these mill claims and that a tailings disposal area adjacent to the plant can be developed with the U.S. Forest Service approval.

In Alternate II, preconcentration of the ore by heavy media separation and subsequent flotation has been considered. In this scheme, approximately 35% of the incoming ore would be rejected as gangue material in the heavy media step. This would result in a flotation plant feed of approximately 130 tpd at 78.5% CaF_2. In this case, it is again assumed that the processing plant, both heavy media and flotation, would be located on the mill claims with the stipulation stated above. The capital requirement for this alternate is approximately $200,000 higher with a corresponding increase of approximately $7.73/ton in operating costs as compared to Alternate I.

With heavy media preconcentration, a lower grade ore can be processed requiring less selective mining. This could result in increasing ore reserves. The net effect of the

increased capital requirement, increased operating cost, and increased reserves will result in a lower return on investment from Alternate II. As can be seen from Alternate III and IV which consider using the Tonto Basin mill, increased operating cost of $9.87 and $4.94 per ton of ore would result as compared to Alternate I.

The alternate flowsheet arrangements are shown in Figures 7-1 and 7-2.

Table 7-4

MILLING CAPITAL COST ESTIMATE

Capital Cost
Order of Magnitude

	ALT. I 200 tpd flotation plant at mine	ALT. II Heavy media & 130 tpd float plant at mine	ALT. III Heavy media at mine & 130 tpd float plant at Tonto Basin	ALT. IV Tonto Basin Mill increased capacity to 200 tpd
Milling	$ 2,216,598	$ 2,142,561	$ 1,100,000	$ 1,350,000
Heavy Media	--	272,000	410,000	--
Pelletizing	150,000	150,000	150,000	150,000
TOTAL	$ 2,366,598	$ 2,564,561	$ 1,660,000	$ 1,500,000

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NOTES ON ABOVE TABLE:

1. 15% contingency included I, II, III and IV
2. Land purchase not included I & II
3. Escalation not included I, II, III & IV
4. Milling plant based on particular used equipment I, II, III & IV
5. Assume negotiated price for Tonto Basin Mill = $1,100,000 II & IV
6. Increase Tonto Basin cost to $1,350,000 for increasing capacity to 200 tpd
7. Includes power generation and water development at mine - mill site I, II & III
8. Awaiting vendor prices on pelletizing equipment

Table 7-5

SUMMARY OF PREDESIGN CAPITAL COST
FOR FLUORSPAR FLOTATION CONCENTRATOR

Item	Machine	Price w/ Motor & Drive	200 TPD	HP	130 TPD	HP
1.	50 ton coarse ore bin	$ 6,500	$ 6,500	0	$ 6,500	0
2.	24"x10' apron feeder	17,300	17,300	5	17,300	5
3.	15"x24" jaw crusher	32,400	32,400	50	32,400	50
4.	10"x50' belt conveyor	6,700	6,700	5	6,700	5
5.	3' standard cone crusher	52,800	52,800	60	52,800	60
6.	10"x50' belt conveyor	6,700	6,700	5	6,700	5
7.	3'x6' vibrating screen	5,100	5,100	2	5,100	2
8.	500 ton fine ore bin	34,000	34,000	0	34,000	0
9.	24"x10' belt feeder	8,200	8,200	1	8,200	1
10.	7'x6" 6D ball mill with spiral screen	140,075	140,075	200	--	--
11.	6'x6" 6D ball mill with spiral screen	117,624	--	--	117,624	125
12.	4"x3" sand pump w/ vari-drive	3,800	3,800	10	3,800	10
13.	D12B cyclone	1,400	1,400	0	--	--
14.	D10B cyclone	1,000	--	--	1,000	0
15.	(2) 6'x6" conditioners	6,675	6,675	10	6,675	10
16.	(1) 8 cell DR 21 flotation machine	23,815	23,815	40	23,815	40
17.	(1) 6 cell DR 21 flotation machine	17,762	17,762	30	17,762	30
18.	(1) 8 cell #21 suba flotation machine	23,000	23,000	40	23,000	40
19.	(1) turbo compressor	2,800	2,800	10	2,800	10

Item	Machine	Price w/ Motor & Drive	200 TPD	HP	130 TPD	HP
20.	(2) 2 1/2" sump pumps	$ 4,800	$ 4,800	15	$ 4,800	15
21.	30' dia. x 8" deep thickener w/ power lift & cone, hand rails, walkways & overflow launders	50,200	50,200	2	50,200	2
22.	3" duplex diaphragm pump	4,418	4,418	2	4,418	2
23.	6'x6 disc filter w/ vacuum package	49,475	49,475	56	49,475	56
24.	5'x40' dryer w/ dust collection	89,600	89,600	20	89,600	20
25.	(2) 60 ton concentrate bins w/ elevator	12,600	12,600	5	12,600	5
26.	(3) automatic samplers	5,325	5,325	5	5,325	5
	Total Foregoing Facilities		$ 605,445	573	$ 582,594	498
	Field erection @ 14%		$ 84,762		$ 81,563	
	Foundation and supports @ 12%		72,653		69,911	
	Piping and chuting @ 22%		133,197		128,170	
	Electrical installation @ 19.5%		118,061		113,605	
	Instrumentation incl. reagent feeders @ 5%		30,272		29,129	
	Misc. site preparation, clean-up and painting @ 5%		30,272		29,129	
	Blding facilities incl. services @ 35%		211,905		203,907	
	Service facilities installed @ 55%		332,994		320,426	
	Total Physical Cost		$1,619,561		$1,558,434	

	200 TPD	130 TPD
Engineering and construction @ 25% of phys.	$ 404,893	$ 389,608
Direct Plant Cost	2,024,451	1,948,042
Contractor's fee @ 5% DPC	101,222	97,402
Tailings pond preparation incl. effluent transportation	225,000	225,000
Concentrator share environmental impact study	30,000	30,000
Spare parts 5% equipment cost	30,272	29,129
Total Estimated Fixed Capital Investment	$ 2,410,945	$ 2,329,573
Estimated deduction for used equipment - 12% of total physical cost	194,347	187,012
Total Estimated Fixed Capital Investment Using Some Used Equipment	$ 2,216,598	$ 2,142,561

Table 7-6

MILLING OPERATING COST ESTIMATE

Cash Operating Cost

$/Ton Ore

	ALT. I 200 tpd flotation plant at mine	ALT. II Heavy media & 130 tpd float plant at mine	ALT. III Heavy media at mine & 130 tpd float plant at Tonto Basin	ALT. IV Tonto Basin Mill increased capacity to 200 tpd
Milling	$ 10.60	$ 15.11	$ 15.11	$ 10.88
Heavy Media	--	3.50	3.50	--
Frt. to Mill	--	--	5.20	8.00
Frt. to Rail	5.06	5.06	2.00	2.00
	$ 15.94	$ 23.67	$ 25.81	$ 20.88

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NOTES ON ABOVE TABLE

(All Alternates Include:)

1. Operating & maintenance labor & supervision including 35% for payroll burden
2. Operating & maintenance supplies
3. Power, water and fuel

Table 7-7

PRE-DESIGN OPERATING COST ESTIMATE
FOR 200 TPD & 130 TPD FLUORSPAR FLOTATION

No.	Operational Personnel	200 TPD Cost/Yr.	200 TPD Cost/Ton	130 TPD Cost/Yr.	130 TPD Cost/Ton
1	Mill supt. @ $24,000/yr.	$ 24,000	$ 0.343	$ 24,000	$ 0.527
*1	Crusher op. @ $8.00/hr.	17,888	0.255	17,888	0.393
4	Mill op. @ $8.00/hr.	71,552	1.022	71,552	1.572
4	Asst. mill op. @ $7.50/hr.	67,080	0.960	67,080	1.474
10	TOTAL OPERATIONAL PERSONNEL	$ 180,520	$ 2.580	$ 180,520	$ 3.976
	Maintenance Personnel				
1	Maint. foreman @ $20,000/yr.	20,000	0.290	20,000	0.440
2	Welder mechanics @ $8.00/hr.	35,776	0.510	35,776	0.786
1	Electrician @ $21,000/yr.	21,000	0.300	21,000	0.462
	TOTAL MAINTENANCE PERSONNEL	$ 76,776	$ 1.100	$ 76,776	$ 1.687
	Unscheduled overtime	11,516	0.160	11,516	0.253
	TOTAL MAINTENANCE LABOR	$ 88,292	$ 1.260	$ 88,292	$ 1.940
	Maintenance material @ 3% capital cost	72,328	1.030	69,887	1.536
	TOTAL MAINTENANCE COST	$ 160,620	$ 2.290	$ 158,179	$ 3.477

*Based on 43 hrs. pay per week x 52

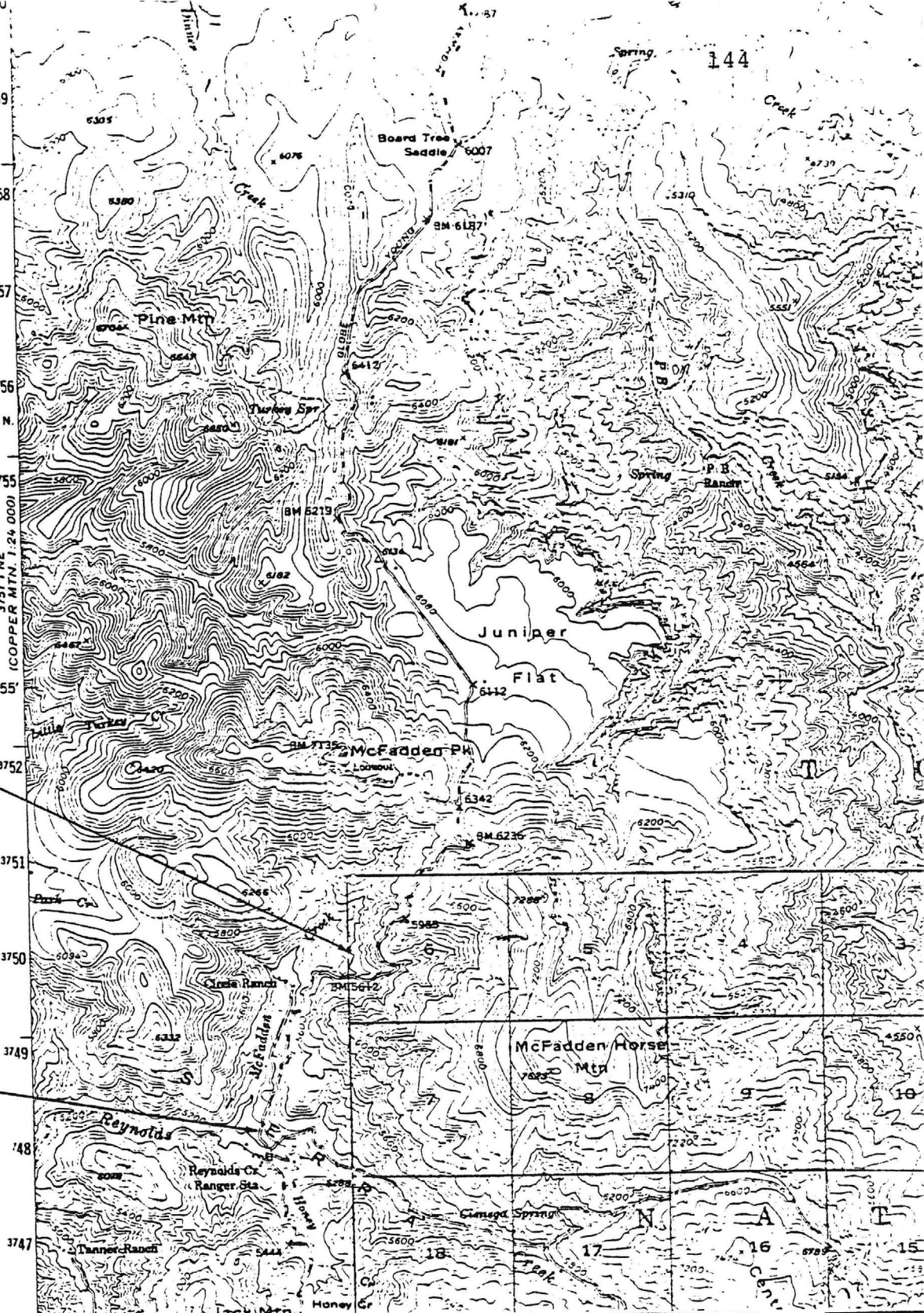
No.	Plant Supplies	200 TPD Cost/Yr.	200 TPD Cost/Ton	130 TPD Cost/Yr.	130 TPD Cost/Ton
	Grinding balls @ .25/ton	$ 17,500	$ 0.250	$ 11,375	$ 0.250
	Liners @ .25/ton	17,500	0.250	11,375	0.250
	Flotation reagents @ .545/ton	38,150	0.545	24,797	0.545
	TOTAL PLANT SUPPLIES	$ 73,150	$ 1.045	$ 47,547	$ 1.045
	Utilities				
	Electric power @ .04/kwh	143,625	2.050	124,825	2.740
	Water, est.	3,500	0.050	2,750	0.060
	Fuel, based on $1.70 per 1,000,000 BTU -				
	Heating buildings, etc. .34/tons milled	23,800	0.340	15,470	0.340
	Drying	52,500	0.750	34,125	0.750
	TOTAL UTILITIES	$ 223,425	$ 3.190	$ 177,170	$ 3.890
	Summary of Direct Costs				
	Operating personnel & supervision	180,520	2.580	180,520	3.970
	Maintenance total	160,620	2.290	158,179	3.470
	Plant supplies	73,150	1.050	47,574	1.050
	Utilities	223,425	3.190	177,170	3.890
		$ 637,715	$ 9.110	$ 563,443	$12.380

No.	Summary of Indirect Costs	200 TPD Cost/Yr.	200 TPD Cost/Ton	130 TPD Cost/Yr.	130 TPD Cost/Ton
	Laboratory	30,000	0.428	30,000	0.659
	Payroll overhead 35% x 268,812	94,084	1.344	94,084	2.060
		$124,080	$ 1.770	$124,080	$ 2.720
	TOTAL OPERATIONAL COST	$761,795	$10.880	$687,523	$15.110

Mill Sites

Four possible mill sites have been investigated. These mill sites are shown on a location map (Figure 7-3) and designated as A, B, C and Mine Site. Land parcels A, B, and C are privately owned and are being offered at an asking price of approximately $200,000 each. The mill site at the mine is on Mill Site Claims WJ-1 and WJ-2. These are not included in the present lease arrangement with Western Fluorspar, but are separate claims held by Woodie Nichols. It is believed that Woodie Nichols would cooperate with Triangle Mining in acquiring these mill site claims without a capital outlay.

Major considerations in evaluating these possible mill sites was availability of water, power and tailings disposal area. The only land parcel that is serviced by a public utility and has proven water reserves is land parcel C (referred to as the "Rock House"). However, since this area is 25 miles from the mine site, it is considered the least desirable. It was decided that power in the other areas would be supplied by on-site diesel generation and an investigation of the water resources for the closer mill sites was undertaken. The water reconnaissance survey is summarized as follows.



Mine Well

A. Reynolds Creek Area

B. Workman Creek Area

C. 15 mi. to Rockhouse Store Area

PINCOCK, ALLEN, & HOLT, INC.
TUCSON, ARIZONA

DATE 9-22-78	McFADDEN PEAK MINE AREA
SCALE 1"=1 mi	QUAD. SECTION
DESIGN	Possible Water Resource Points
DRAWN	
CHECKED	Figure 7-3
	FILE 135.01

Land Parcel Areas

Parcel A: Reynolds Creek Area; S1/2, Sec. 12, T6N, R13E. Approximately 1.25 miles south of the present mine access road. This area has no history of groundwater production. Younger Precambrian quartzites form outcrop patterns in and adjacent to the boulder paved stream. The occurrence of any porous and permeable rock formations likely to contain and transmit water could not be ascertained. Small amounts of spring water form some shallow pools along the stream bed. The examination of this area was made with Mr. Woodie Nichols and Mr. O.T. Smith.

Conditions suitable for the production of the required amount of groundwater do not appear to be present in this area when considering the possibility of developing an aquifer in the type of rock exposed on the surface. Any qualification of this comment would require the drilling of a test well with the intent of intersecting sufficient water carrying fractures to supply an unknown quantity of water. This type of venture involves a higher than ordinary amount of risk.

Parcel B: Workman Creek Area; SW1/4, Sec. 24, T6N, R13E. Approximately 3.5 miles south of the present mine access road. This area has no available history of groundwater production; however, the present owner, Mr. John Schminke, said

that a small well used for domestic water supply did exist at one time but was filled with debris when he acquired the property. Water for use at the ranch is furnished by the nearby creek.

This area fits a pattern similar to the Reynolds Creek area. A small tract of about 3-4 acres of alluvium of unknown thickness exists along the east bank of the stream and is being prepared for future irrigation by water from Workman Creek, if Schminke can obtain a water right. He is not optimistic regarding the availability of a supply of groundwater sufficient for the operation of a mineral processing mill. There is nothing apparent which would tend to recommend this area for consideration as a mill site.

Proposed mill site encompassing the present mine security post:

Before the present mine operator, Fred Murphy, took over the workings, a well was drilled at the security post location to furnish water for the mining operation. A pumping test was performed on this well under the supervision of a PAH engineer. The results of this test are summarized below:

Pump: 5 hp, 13 stage submersible with su
set at 57'

Discharge pipe diameter: 2"

Sounded depth: 63'

Duration of test: 6.5 hours

Static water level: 17.5' below top of casing

Average discharge rate: 40 gpm

Draw down: 35'2" (draw down stabilized at 52'7" be
top of casing after 2 hours and 27 min. of pumpi

Specific capacity: 1.14 gal. per minute per foot of
draw down

Well recovery: 1 hour after pump was turned off

The 40 gpm (average rate) rate is maximum for this well at its present depth. It is possible that a deeper well penetrating fractured rock located at or near the site of the tested well would produce a larger amount of water. It is also possible that additional locations, one to three, could be drilled in the general area of the proposed mill site.

The mill site, as outlined on the site map, is approximately 460' x 920'. The existing well is apparently located within the southern part of this area. Additional supplies of water could possibly be obtained from wells located immediately to the south of the mill, adjacent to the existing access road.

The configuration, location, and size of the proposed mill site does not enhance the possibility of locating additional wells within its boundaries. We feel confident that an adequate supply of water can be developed in the area but recommend that arrangements be made to acquire sufficient acreage to the south to provide working space.

The local topography creates a moderately sized basinal catchment and watershed area south of Mt. McFadden and including the proposed mill site area. There is some widening of the area at lower elevation below the mine site and the confluence of local drainage with the McFadden Creek would provide the possibility of some recharge to the area. Below Circle Ranch and the well site mentioned above, the drainage area narrows noticeably. A test at the location mentioned above could possibly furnish a part of the required amount of water to operate a mill. There is the possibility of acquiring supplementary groundwater supplies, amounts unknown, from the Circle Ranch area which, according to Mr. Nichols, is part of the overall claim transaction. This being so, the transfer of water from the ranch area to the proposed mill site adjacent to the mine workings area should pose no legal problem. The Circle Ranch area could also be considered as a future mill site, providing water supplies are adequate in the general area.

The dependence upon surface water to fulfill mill requirements is unreasonable at this time. The intermittent history of creek flow and the legal interaction over water rights would tend to discount any consideration in this direction. If a mill is planned for construction at any of the sites discussed in this report, with the exception of the Rockhouse area, it must be considered that a single well at any site or location may not furnish sufficient amounts of groundwater for operation of the mill. Supplementary supplies of water derived from adjacent areas must be part of the consideration in setting a mill advantageously close to the mine workings. In addition, a program of water reuse would be a necessary part of planning.

8. MARKETING

The most profitable markets for the McFadden Peak fluorspar would be geographically located west of the Rocky Mountains. In this market area, the Arizona produced fluorspar would have the freight advantage over fluorspar produced in the Southeast and Midwestern U.S. as well as that produced in Mexico. The major consumers in this Western geographical area and their annual consumptions are listed in the following table:

Product	Company & Location	Annual Short Tons 1978	Annual Short Tons 1979-80 est.
Acid Grade	Allied Chemical Pittsburgh, CA	13,000	15,000
Acid & Ceramic Grade	Miscellaneous companies	1,000	2,000
Metallurgical Grade	Kaiser Steel Fontana, CA	20,000	20,000
Metallurgical Grade	U.S. Steel Geneva, UT	17,000	17,000
		51,000	54,000

At a 200 tpd milling rate with a 63% C_aF_2 grade and an 87% recovery, production would be approximately 38,000 tpy of concentrates. This is equal to about 74% of the consumption of the above users. However, it is not unreasonable to project that from 70% to 90% of this listed consumption can be supplied from an Arizona producer. This is based on the fact that at present, approximately 90% of the metallurgical spar consumed by Kaiser

and U.S. Steel is imported from Mexico and that Allied Chemical has a purchase agreement with Western Fluorspar for approximately 18,000 tpy of metallurgical grade material.

The present purchase agreement that Western Fluorspar Company has with Allied Chemical is considered extremely important. This order calls for approximately 18,000 tons of acid grade fluorspar to be shipped from January 1, 1978 to December 31, 1978 at a price of $93/ton F.O.B. Mesa, Arizona. This would account for approximately 1/2 of the production from a 200 tpd flotation mill. Western Fluorspar Company has not been able to meet the tonnage requirements of this agreement because it is undercapitalized to do the job right. However, correspondence and telecommunication with Allied Chemical has indicated Allied's desire to continue this agreement with Triangle Mining. We have confirmed that the fluorspar price at the Mexican border will be increased approximately January 1, 1979. This would amount to an increase of $3.[illegible] per ton for metallurgical grade fluorspar, and $5.58 per ton for acid grade fluorspar.

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During conversations with Mr. Harry Stratton, the District Traffic representative for Southern Pacific, it was learned that the freight rate on metallurgical grade fluorspar originating in Mexico shipping from either El Paso, Texas or Douglas, Arizona, is $19.84 per ton. This is a permanent freight rate. The published freight rate for shipping from Globe, Arizona

to Kaiser Steel in Fontana, California, is $27.00 per ton. This appears quite high in comparison to the rate that Kaiser is paying from El Paso which is further away. SP traffic man did point out that El Paso is on a main line whereas Globe is on a feeder line. The nearest main line is Mesa, Arizona, which is 79 miles farther away. The freight rate shown on a 1978 blanket purchase order from Allied Chemical for acid grade fluorspar for Mesa to Pittsburgh, California, is $15.49 per ton. In view of the present rate structure, it would be more economical to truck the fluorspar to Mesa and ship via an SP main line.

The following analysis shows what the ore value would be with the increased purchase price and trucking hauling the concentrate to Mesa to take advantage of the lower freight rate on the main line.

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Pincock, Allen & Holt, Inc.

Value of Metallurgical Grade at Mesa

Calculated Price Delivered to Kaiser

Mexican border, fob cars - E & MJ	$ 66.69 (incl. 6% increase, 1/1/79)
Import duty	7.50
Border charge	2.00
Freight to Kaiser Steel	+ 19.84
Total delivered	$ 96.03/ton

(Cont.)

Delivered price currently being paid by Kaiser for Mexican gravel w/ 6% increase 1/1/79	$ 96.03
Present freight rate for acid grade from Mesa to Pittsburgh, California	- 15.49
Value/ton of metallurgical grade fluorspar at Mesa rail head	$ 80.54

Converting this to tons of metallurgical grade product/ton of production gives:

$$\$80.54 \frac{(.63 \text{ grade}) \times (.87 \text{ recovery})}{(.75 \text{ concentration w/ } 2\ 1/2\% \text{ silica})} = \$58.86/\text{ton of ore sold as met. grade at Mesa}$$

The truck freight rate from the mine site to Mesa is figured as follows:

Truck haulage from minesite to Miami over rough road, 46 miles @ 8¢/ton mile	$ 4.13/ton
Truck haulage from Miami to Mesa on good road, 75 miles @ 5.5¢/ton mile	3.68
	7.81/ton

TO BE READ AND EVALUATED IN CONJUNCTION WITH P.A.H. ADDENDUM I, MARCH 1979, WHICH IS AN INTREGAL PART OF THIS DOCUMENT.
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Converting this to freight rate per ton of ore sold as metallurgical grade product is as follows:

$$\$7.81 \frac{(.63)(.87)}{(.75)} = \$5.71/\text{ton}$$

Value of Acid Grade at Mesa

Present price being paid by Allied Chemical w/ 6% increase 1/1/79 $ 98.58

Converting this to tons of acid grade product/ton of production gives:

$$\$98.58 \frac{(.63 \text{ grade}) \times (.87 \text{ recovery})}{(.97 \text{ concentration})} = \$\ 55.70/\text{ton of ore sold as acid grade at Mesa}$$

The freight rate from the mine site to Mesa per ton of ore sold as acid grade is as follows:

$$\$7.81 \frac{(.63)(.87)}{(.97)} = \$4.41/\text{ton}$$

TO BE READ AND EVALUATED IN CONJUNCTION WITH P.A.H. ADDENDUM I, MARCH 1979, WHICH IS AN INTREGAL PART OF THIS DOCUMENT.
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Value of Combined Product

It was shown in an earlier report that sales will consist of 50% acid grade and 50% metallurgical grade. This will give a combined product value at Mesa as follows:

$58.86 (.50) + $55.70 (.50) = $57.28/ton of ore

The freight rate from the mine to the rail head at Mesa for the combined product is:

$5.71 (.50) + $4.41 (.50) = $5.06/ton of ore

We have continued our investigation into obtaining better freight rates from SP for shipment from Miami, Arizona to Kaiser Steel in Fontana, California. The procedure for applying for a new rate would be to write Mr. Harry Stranton, the District Traffic Representative for SP in Tucson. This letter should contain the following information:

1. Description of the material
2. Material density
3. Particle size
4. To and from locations
5. Type of car required, etc.

He will acknowledge receipt of the letter and then refer it to the Phoenix office. The Phoenix office will acknowledge receipt and then refer it to San Francisco where they will make the request public and give prices. This could be done without divulging the company name but usually this leaks out. This process will take 2 - 3 months. Mr. Stranton pointed out that the best way for this to be done would be to have the buyer petition the railroad. He would have a greater influence since in the case of Kaiser Steel, the railroad counts on their business. He went on to say that actually, the buyer could probably determine the freight rate right now within a few cents of what the railroad would finally negotiate to. Also,

there are consultants available who specalize in negotiating rail freight rates.

Domestic production of metallurgical grade and acid grade fluorspar has continued to decline over the past several years while imports have risen to approximately 81% of the apparent consumption. The major foreign suppliers of fluorspar are Mexico at 60% of total U.S. imports, South Africa at 27%, Spain at 10% and Morocco at 3%. Acid grade comprised 65% of the U.S. fluorspar imports with metallurgical grade including briquets making up the balance during the first quarter of 1978.

In March 1977, legislative bill HR 5265 was introduced to the House Ways and Means Committee in Washington, D.C., and during the first week of September 1978 it was approved and submitted to the U.S. House of Representatives. The bill recommends the elimination of the U.S. import duty on acidspar and metspar for all favored nations for a period of two years. Historically, two other attempts have been made by the U.S. steel and aluminum industries to push through a similar bill or to attach it to another bill as a rider, but they failed. It is predicted that this bill will fail, unless it is unknowingly attached to a foreign trade bill. Even if it passes the House, there does not appear to be enough time to push it through the joint committees for the House and Senate. If the U.S. domestic mining industry does not oppose it strongly, the

congressmen may slip it through. This legislation should be closely monitored and its effect on the pricing structure evaluated.

TEBTELING

APPENDIX

PRELIMINARY ROCK MECHANICS STUDY

PINCOCK, ALLEN & HOLT, INC.

PRELIMINARY ROCK MECHANICS STUDY

Geology

The geology of the area was previously discussed by W. C. Peters of Pincock, Allen & Holt, Inc. However, a brief discussion of the geology, to emphasize those items important to a rock mechanic analysis, follows.

The fluorspar vein has a dip direction of around 175° and a dip of approximately 75°. Its minable thickness ranges from 3.0 to 12 ft., with an average around 5 ft. The upper portion of the footwall and hanging wall is usually hornfels with interbedded quartzite, and the lower portion is generally massive quartzite. At the west end of the vein, the quartzite is at the surface, while at the east end the quartzite is 300 ft. below the surface on the hanging wall side and 250 ft. on the footwall side. Bedding has a general dip direction of 0 - 30° and a dip of 0 - 15°. Diabase sills or dikes can locally make up the wallrock.

Rock Mass Strength

Strength of the rock mass is a function of the strength of intact rock, the strength of geologic structure (joints, faults, etc.), and the characteristics (orientation, length, spacing) of the geologic structures. These values can be

measured and combined to estimate the rock mass strength.

Geologic structures are defined as major structures and rock fabric. In design, major structures, such as faults, are usually considered individually because they are a local occurrence. Rock fabric which is predominantly jointing has a high frequency of occurrence and is not continuous. For design, areas with similar joint orientations are defined as structural domains; within a domain the statistical distributions of joint set characteristics (orientation, length, spacing) are used to define the occurrence of jointing.

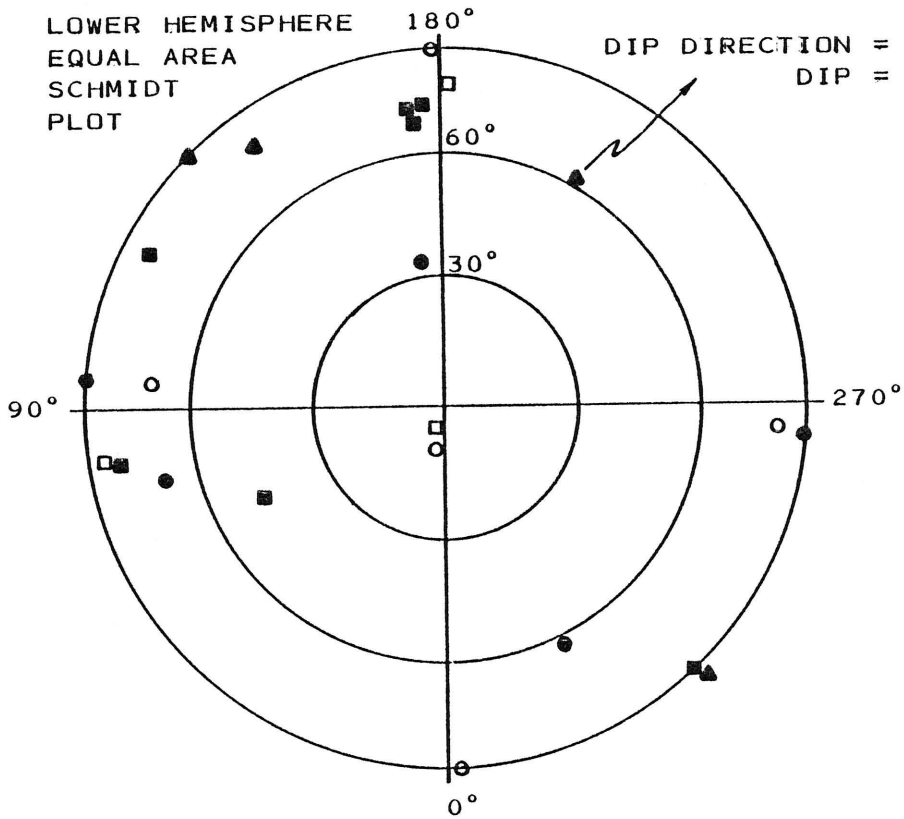
Joint set mapping orientations, collected by D. E. Nicholas, and structure data, recorded by W. C. Peters during surface mapping, were plotted on a lower hemisphere Schmidt plot (Figure A-1). Although the data is limited, there appear to be four major joint sets in the hornfels and quartzite, and possibly four sets in the fluorspar. The average joint orientations of these sets are:

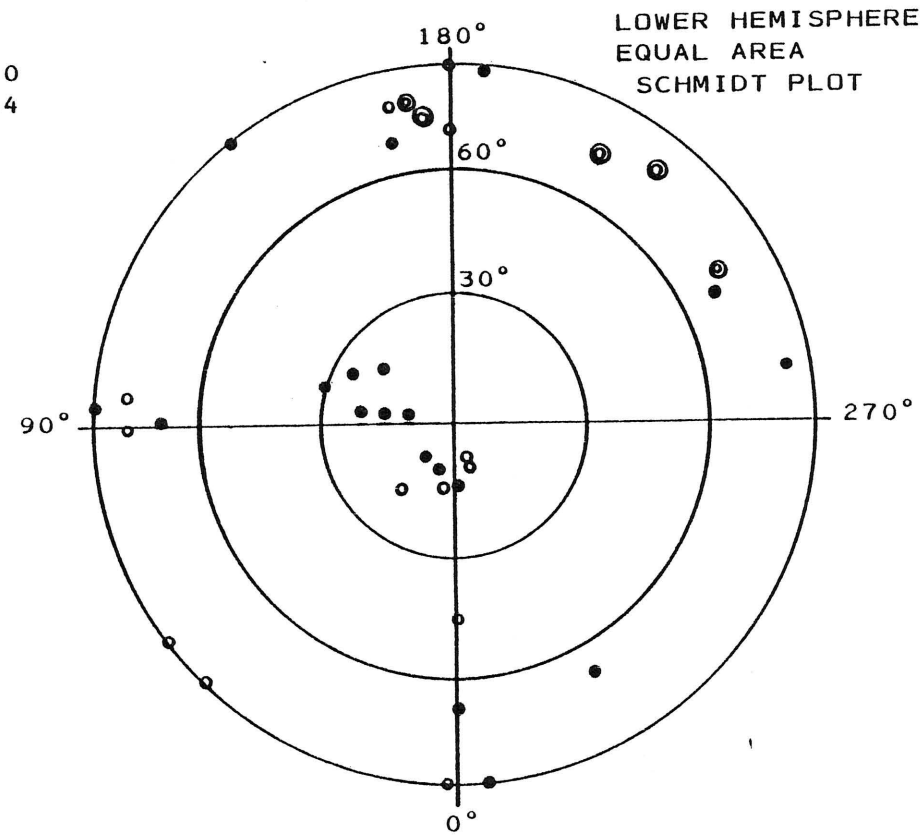
Set Name	Est. Mean Dip Direction	Est. Mean Dip	Comments
	Hornfels and Quartzite		
2.1	20°	10°	Parallel to bedding
9.8	90°	80°	
18.9	180°	90°	
14.9	140°	90°	
	Fluorspar		
17.7	175°	73°	Parallel to bedding
13.8	130°	85°	
8.8	80°	85°	
6.4	64°	46°	

The set name is obtained by dropping the last digit of the dip direction and dip. For example, for a 175° dip direction and a 73° dip, the set name would be 17.7.

The lengths and spacings of the joint set data are summarized in Table A-1. Joints in the hornfels were generally unfilled; however, the joints in the fluorspar parallel to the vein contained a clay gouge that ranged in thickness from 0.1 to 2 inches. Most of the faults also contained some clay or were slickensided.

NOTE: READ DIP DIRECTION DIRECTLY





- ● DIABASE
- ○ HW HORNFELS
- □ FW HORNFELS
- ■ JOINT SET - FLUORSPAR
- ▲ FAULT

JOINT SET DATA COLLECTED BY D.E. NICHOLAS

- ● QUARTZITE
- ○ HORNFELS
- ◎ HORNFELS - FAULTS

STRUCTURE DATA COLLECTED BY W.C. PETERS

FIGURE A-1: SCHMIDT PLOTS OF GEOLOGIC STRUCTURES AT McFADDEN PEAK PROPERTY

Table A-1

JOINT SET CHARACTERISTICS

Site Location/ Rock Type	Structure Type	DDR	Dip	Mean Spacing (ft)	Mean Length (ft)
Site 4					
Diabase	JS	334	64	0.9	5.0
	JS	75	69	0.6	0.7
	JS	172	34	1.1	1.4
	JS	95	90	0.2	1.3
Site 2					
Hornfels (HW)	JS	178	90	0.3	1.6
	JS	10	9	2.3	9.5
	JS	274	83	0.6	3.0
	JS	95	70	0.6	0.9
Site 2					
Hornfels (FW)	JS	81	85	1.5	5.0
	JS	02	05	2.2	6.7
	JS	181	81	0.4	6.4
Site 1					
Fluorspar	JS	176	75	0.9	+10
	FT	210	64	-	-
Site 1 Fluorspar	JS	174	22	0.6	+10
	JS	62	46	1.2	1.0
	JS	118	81	0.8	1.2
	FT	136	90	-	-
Site 1					
Fluorspar	JS	175	74	0.7	+10
	JS	81	82	0.7	1.7
	FT	146	80	-	-

RQD, Rock Quality Designation, is another indicator of how fractured or broken the rock is. RQD is the sum of the lengths of all core pieces 4 inches or longer, divided by the length of interval drilled. The lower the RQD, the more fractured the rock. Data from holes T-1 and T-2 indicate the average RQD ranges between 7 and 20% for the fluorspar, 29 to 37% for the hanging wall (within 20 feet of the vein), and 17 to 71% for the footwall quartzite (within 20 feet of the vein).

For pillar design, the shear strength of the intact rock and of geologic structures is required. We can define shear strength based on the Mohr-Coloumb failure criteria:

$$\tau = C + \sigma_n \mathrm{Tan}_{\phi},$$

where

τ = shear strength

σ_n = normal stress

C = cohesion

ϕ = friction angle.

Intact rock shear strengths are determined from uniaxial and triaxial compression tests. Shear strengths of geologic structure are measured from direct shear tests. For this preliminary study, we have tested only three samples in uniaxial compression and extrapolated intact rock shear strengths. Shear strengths along structures have been estimated by visual inspection.

Results of the uniaxial compression and disk tension tests are summarized in Table A-2. Given an estimate of the uniaxial strength and using a back analysis by Coates (1970), an estimate of the intact rock friction angle and cohesion can be made (Figure A-2). The majority of "hard" rocks (fluorspar is considered as one) generally have intact rock friction angles of 40° to 50°. Until further rock testing can be justified, we will assume an intact rock friction angle of 45°, which corresponds to a cohesion between 1480 and 3300 psi. Geologic structures generally have friction angles between 25° and 35° and a 5 to 25 psi cohesion.

Table A-2

FLUORSPAR UNIAXIAL COMPRESSIVE & DISK TENSION STRENGTHS AND ELASTIC PROPERTIES

Block	Sample	Uniaxial Strength (psi)	Disk Tension (psi)	Young's Modulus ($x10^6$psi)	Poisson's Ratio
A	1	15,920	464 508	9.4	0.08
A	2	15,950	527 654	9.7	0.10
Average of Block A		15,940	540	9.6	0.09
B	1	7,160	474 444	11.9	<0.01
Combine Average of Blocks A & B		11,550		10.80	0.05

$$C = \frac{\sigma_1 \text{ TAN } \phi}{[\text{TAN}^2(45+\frac{\phi}{2})-1]}$$

σ_1 = UNIAXIAL COMPRESSIVE STRENGTH

ϕ = FRICTION ANGLE

C = COHESION

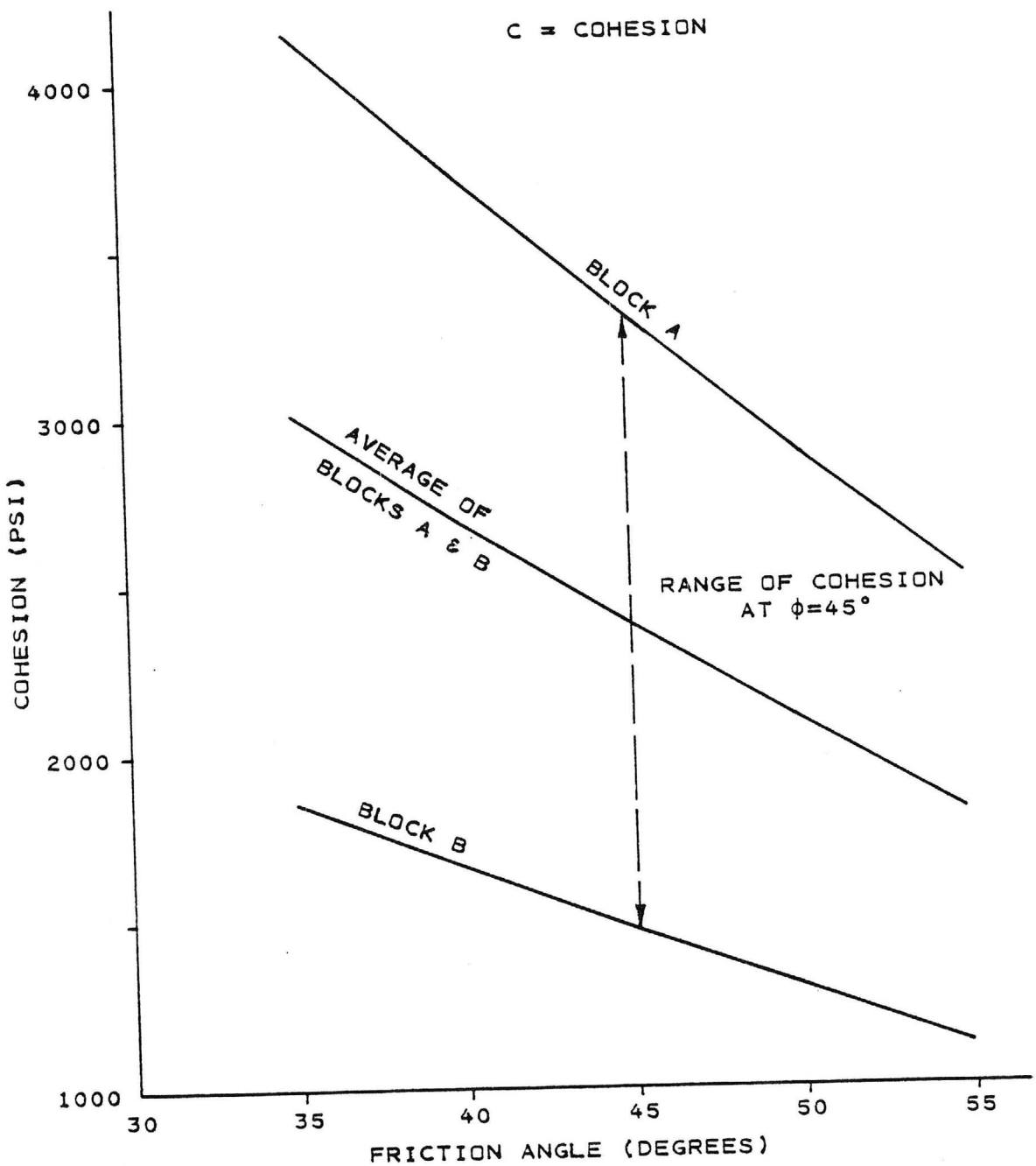


Figure A-2: Estimate of Friction Angle and Cohesion from Uniaxial Compressive Strength

The uniaxial compressive strengths of intact core are also used for comparison with other mines and for estimating operating cost. Based on field observations and experience, an estimate of the range of strengths has been made:

	Estimated Strengths		
Rock Type	Average (psi)	Minimum (psi)	Maximum (psi)
Hornfels	10,000	6,000	16,000
Quartzite	15,000	8,000	25,000
Fluorspar	11,000	4,000	18,000
Unaltered Diabase	20,000	10,000	30,000
Altered Diabase	2,000	0	5,000

The rock mass friction angle is calculated as follows:

$$RxM\phi = (\%IRx/100)(IRx\phi) + (\%FRx/100)(F\phi),$$

where

$RxM\phi$ = rock mass friction angle

$\%IRx$ = percent intact rock

$IRx\phi$ = intact rock friction angle

$\%FRx$ = percent of fractured rock

and

$F\phi$ = friction angle of geologic structure.

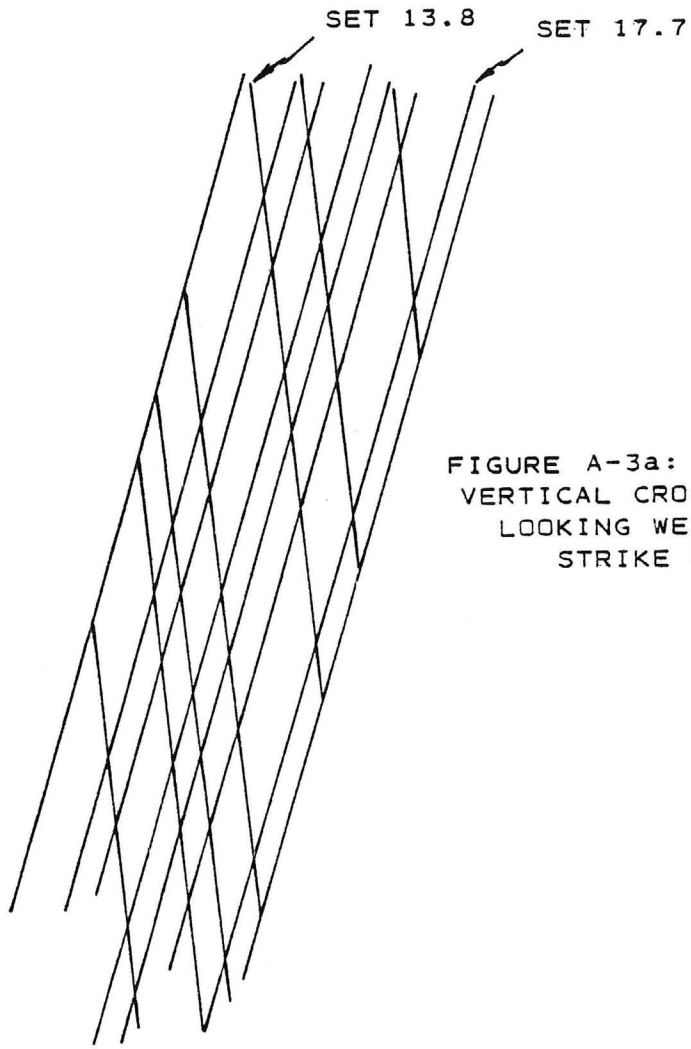


FIGURE A-3a:
VERTICAL CROSS SECTION
LOOKING WEST ALONG
STRIKE OF VEIN

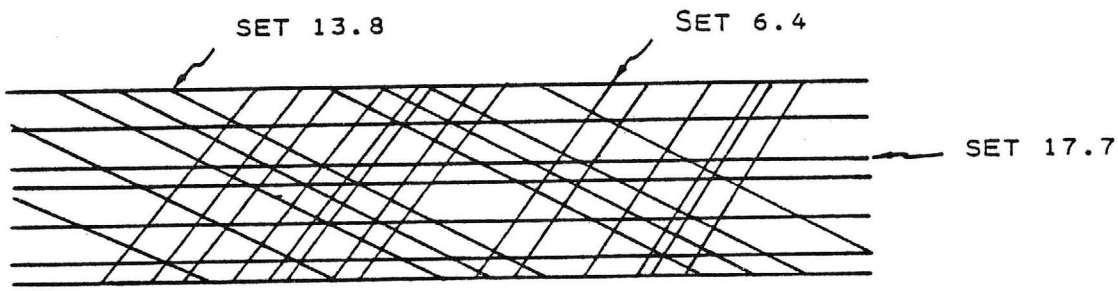


FIGURE A-3b: HORIZONTAL SECTION OF VEIN

FIGURE A-3: GEOLOGIC STRUCTURES AFFECTING STABILITY OF PILLARS - MCFADDEN PEAK

The rock mass cohesion is calculated in a similar manner. The critical structures for pillar design are those parallel to the vein, joint set 17.7 (Figure A-3a). As has been observed, when exposing an up-dip face, blocks will slide out along clay-filled joints and faults parallel to the vein. Consequently, the pillars should be continuous from the top of the deposit down to the bottom. Failure could also occur along sets 6.4 and 13.8 (Figure A-3b), if they were daylighted. Designing for a 10 ft. wide vein, pillar widths greater than 10 ft. will have only a limited number of these two structures daylighted. Sets 13.8 and 8.8 or 13.8 and 6.4 could produce a wedge geometry of limited length for failure. Based on the length and spacing data, and for pillar widths greater than or equal to stope heights, we assume that a failure path would be composed of 50% geologic structure and 50% intact rock. Then, the anticipated range of rock mass strength properties for the fluorspar is:

friction angle = 35° to 40°

and

cohesion = 740 to 1660 psi.

Pre-Mine Stress Field

The pre-mine stress is the most difficult parameter to determine. The pre-mine stress field is used in conjunction with the geometry of the mine layout to calculate the

load on the rock pillars. It can be measured using an overcoring technique, but this method is expensive (+$20,000). In the absence of direct measurements, the pre-mine stress field can be estimated by using the elasticity theory, hydrostatic stress, and geologic structure.

Using the theory of elasticity, and assuming the principal stress is caused by gravity, that is, the vertical stress is equal to the weight of the overburden rock, the horizontal stress is 1/3 to 1/2 the vertical stress. However, we do not consider the rock mass at McFadden Peak elastic because of the past tectonic events.

Another method for estimating the pre-mine stress field is to assume a hydrostatic state, that is, the stresses are equally applied in all directions and are equal to the overburden stress. This approach can be justified when the rocks were either formed in a liquid state or deposited in water, a hydrostatic stress condition.

The pre-mine stress field can often be predicted from geologic structure because geologic structures result from the action of stress fields on rock. Based on empirical data and the knowledge that the vein was originally a normal type fault, the principal stress is probably parallel to the strike

of the vein and slightly greater than the overburden stress. Minimum principal stress is probably normal to the fault and less than the overburden stress. The intermediate stress would be down-dip of the fault and equal to the overburden stress. In those areas where recent faulting that cross cuts the vein has occurred, the principal stress orientation would probably line up with these younger faults.

The hydrostatic and geologic structure analyses would predict similar stress magnitudes. For this study, we will assume a hydrostatic stress field for estimating stress magnitude. Because of the possibility of slightly higher stresses parallel to the strike of the vein, where possible an opening in the rock should be oriented so that its minimum cross-sectional area is normal to the strike of the vein. This will help minimize the chance of high stress concentrations.

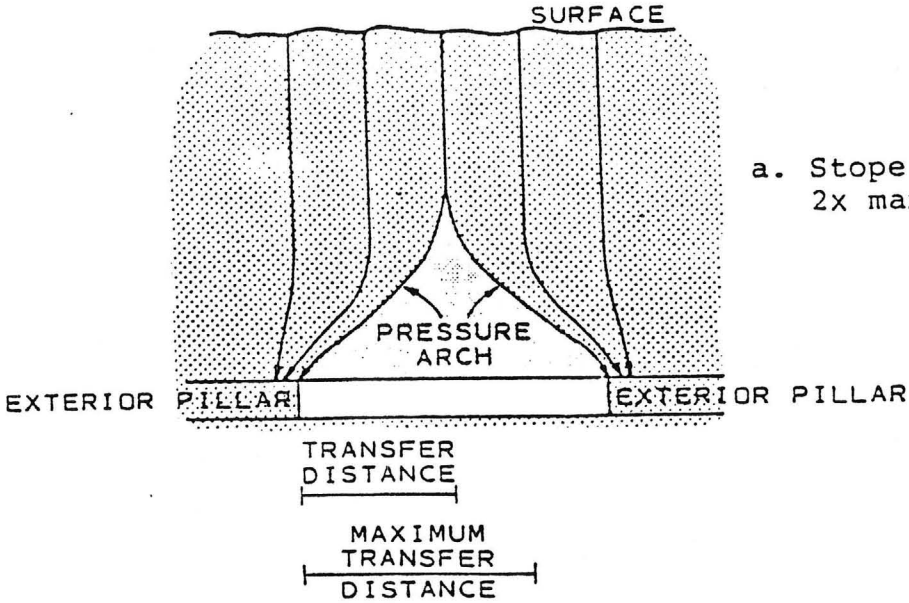
Stope Dimensions

Stope height depends on ore thickness and equipment limitations. Minable vein thicknesses range from 3.0 to 12 ft., with an average of 5 ft. For this study, we have used a height of 10 ft., which will include most areas along the vein. Stope length and width depends on the method of mining and the stability of the rock above the stope.

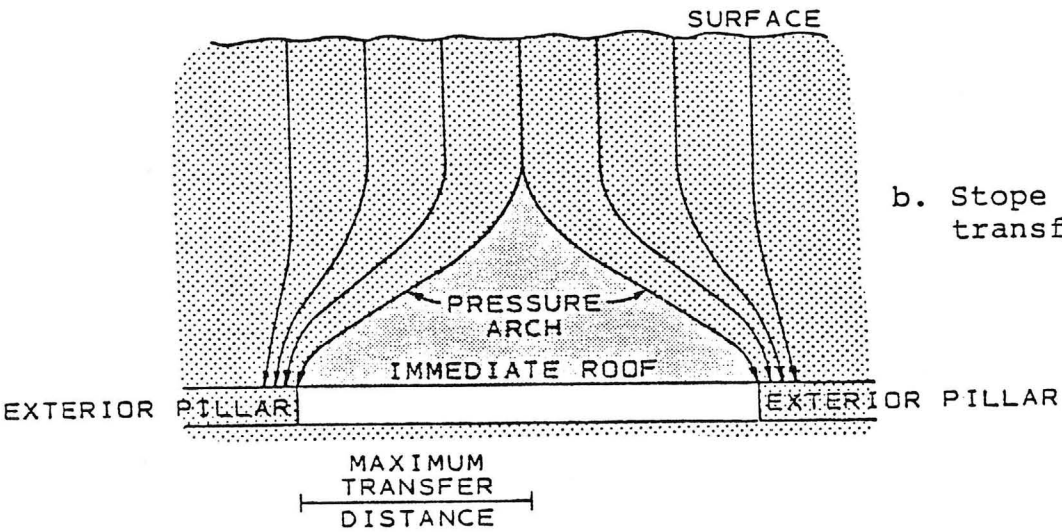
In the proposed mining system, each stope will begin as a 10 ft. wide raise and will then be mined in 18 ft. increments along strike on each side of the raise. This means stope widths of 45 ft., 82 ft., and 118 ft., etc., would be preferred. Stope lengths of around 300 ft. are anticipated, based on the current ore reserve limits.

For stopes that are at least 1.5 times as long as they are wide, the stability of the stope is a function of width only. Rock above the stope can be divided into two zones for stability purposes: immediate roof and intermediate roof.

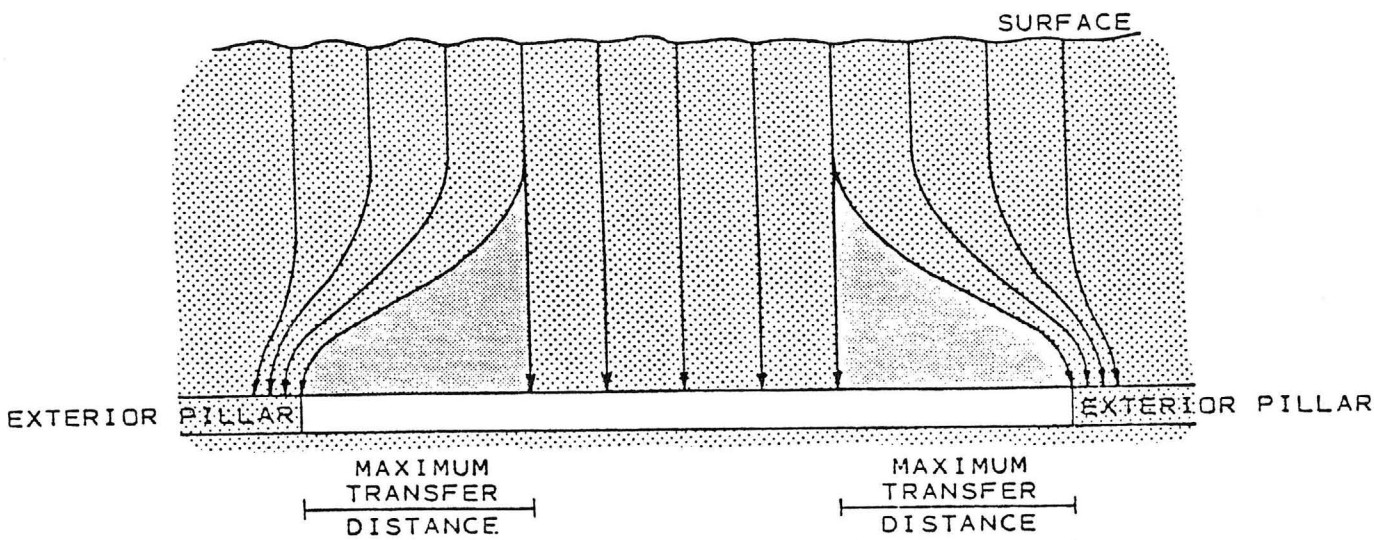
The intermediate roof is defined by the pressure arch (Figure A-4) and is the result of the ability of the rock mass to transfer stress to the nearest load-carrying support. The maximum width of the pressure arch depends on the maximum transfer distance (Figure A-4). Currently, there is no equation to calculate this maximum transfer distance. The only available data is from existing mines that have "measured" this distance. Field measurements from European coal mines, French iron mines, and a United States sedimentary copper deposit indicate that a relationship exists between depth and the maximum transfer distance (Figure A-5). However, each rock mass has a different depth versus maximum transfer distance correlation, and the deposits which have been measured



a. Stope width is less than 2x maximum transfer distance



b. Stope width is 2x maximum transfer distance



c. Stope width is greater than 2x maximum transfer distance

FIGURE A-4: MAXIMUM STRESS TRANSFER DISTANCE CONCEPT

(1) BARIENTOS & PARKER (1974)
(2) WOODRUFF (1966)
(3) ALDER, POTTS, & WALKER (1951)
(4) THE NORTH OF ENGLAND SAFETY IN MINES RESEARCH COMMITTEE-7TH PROGRESS REPORT (1948-49)

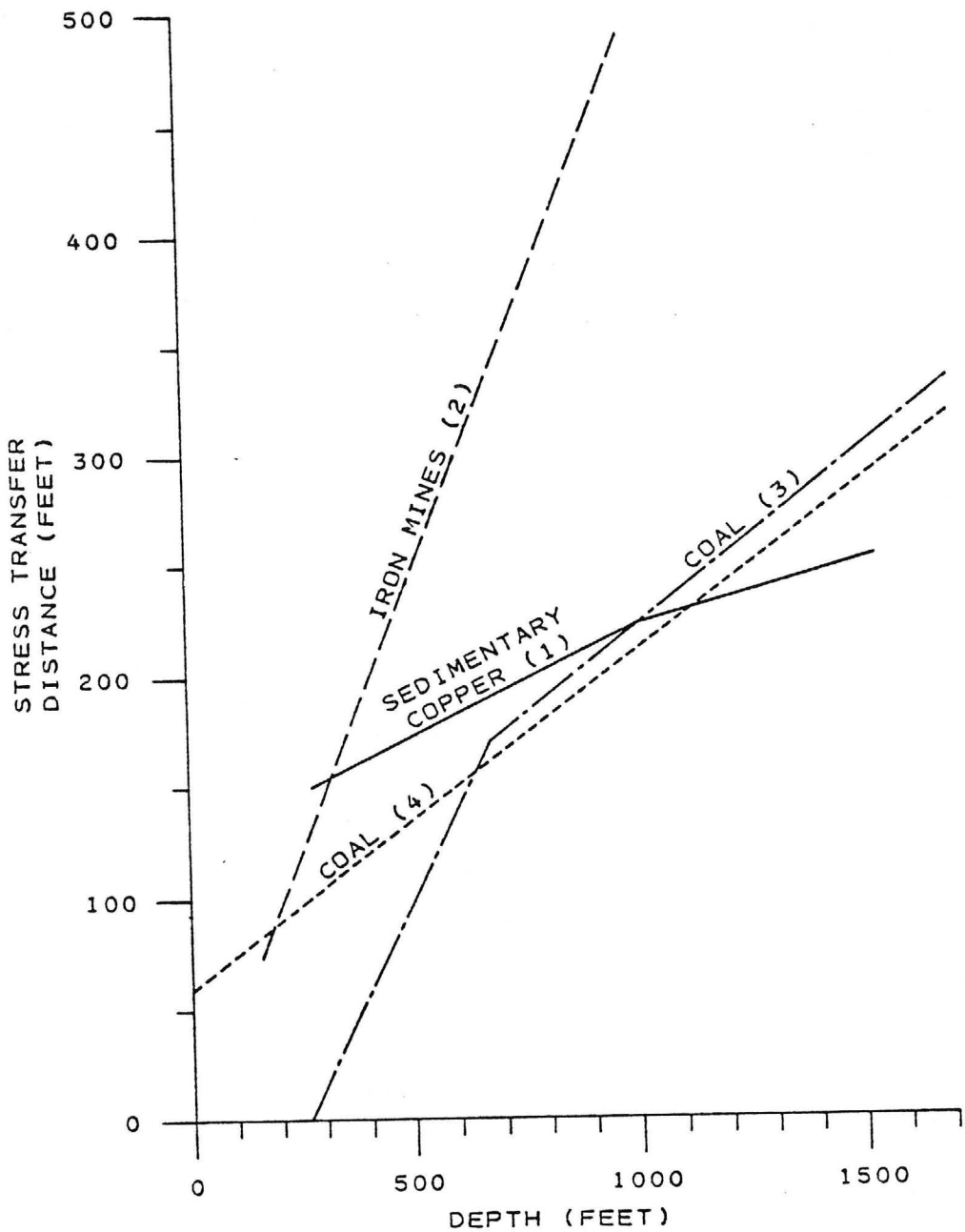


FIGURE A-5: STRESS TRANSFER DISTANCE

to date are all near horizontal beds. One stope in the present mining operation at McFadden Peak has a width of approximately 45 ft., indicating the maximum transfer distance is at least 22.5 ft. Based on our field observations, stope widths of other near vertical vein mines, and the maximum stress transfer distance, we feel a maximum transfer distance of between 25 - 75 ft. is likely, that is, unsupported spans of 50 to 150 ft. are possible.

The rock under the pressure arch is the immediate roof; it will be destressed, and stability will be controlled by geologic structures. Figure A-6 shows that the vertical structures, sets 18.9, 9.8 and 14.9, and the joint set 2.1, will be critical to roof stability. Set 18.9 will probably be the major control of the dip of the back. If these structures were all parallel to the vein, little loose rock would fall. However, because of the variability of dip, some of these structures will be daylighted. Therefore, to reduce dilution and protect men from falling rock, we recommend 6 ft. rock bolting with wire mesh.

The spacing between bolts is a function of joint spacing, shear strength along the joints, and shear strength of the rock bolt anchor system. Through model studies, Coates suggests that rock bolt spacings should not exceed 5 times the

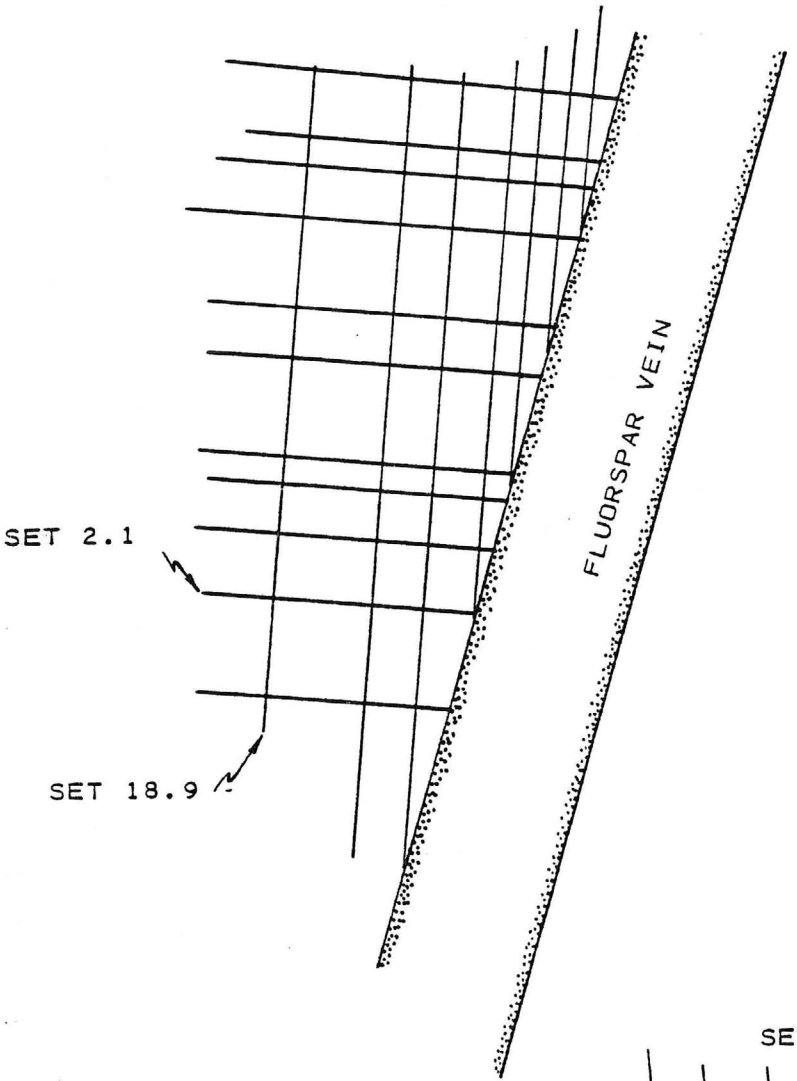
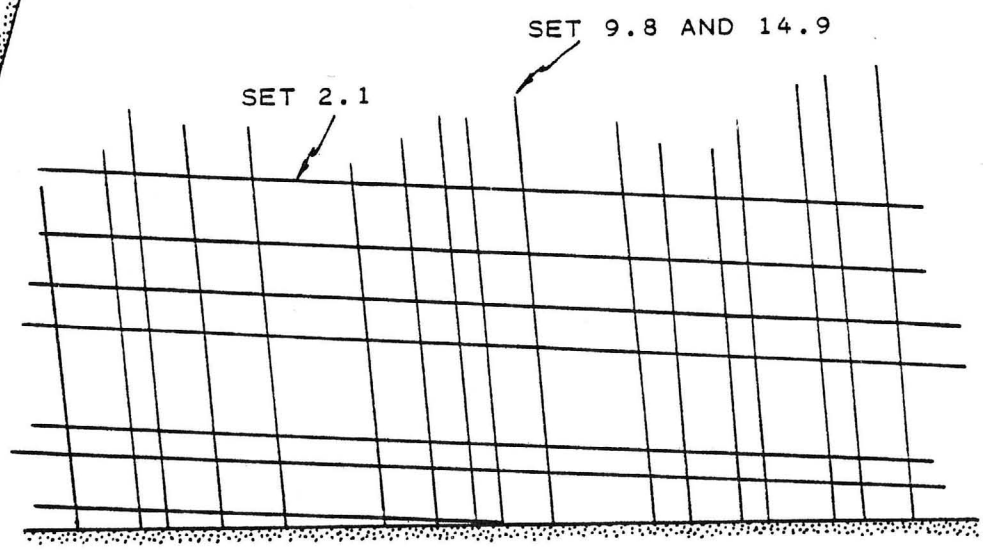


FIGURE A-6a:
VERTICAL CROSS SECTION
LOOKING WEST ALONG
STRIKE OF VEIN



FLUORSPAR VEIN

FIGURE A-6b: VERTICAL CROSS SECTION LOOKING
NORMAL TO STRIKE OF VEIN

FIGURE A-6: CROSS-SECTION OF GEOLOGIC STRUCTURES AFFECTING
THE STABILITY OF THE ROOF - MCFADDEN PEAK

joint spacing when using wire mesh or other support. By using Coates' approach and estimating joint spacings of the vertical joint sets in hornfels (Table A-1), we predict rock bolt spacings of 1.5 to 7.5 ft.

Using the Scott split set rock bolts, an estimated shear strength of 3/4 to 1-1/2 tons per running foot of anchor can be attained. For a 6 ft. bolt, if only the last 3 ft. is the anchor, a block with 9 to 18 sq. ft. can be carried. Although the miner should determine the actual rock bolt spacing, we recommend, as a starting point, a spacing of 4 ft.

As indicated by the low (0 - 40%) RQD data, the hanging wall will be ravelly; therefore, wire mesh is needed. Excessive stability problems will occur when blasting breaks into the hanging wall, thus daylighting a large number of vertical structures along which failure can occur. Consequently, care should be taken when blasting along the hanging wall.

From this analysis, if a quality rock bolting and wire mesh program is followed, the stope width would be more controlled by the maximum stress transfer distance than by the stability of the immediate back. As a starting point, we suggest 82 ft. wide stopes, although widths of 46 to 154 ft. may be possible.

Pillar Dimensions

Pillar stability is a function of the dimensions of the pillar, stress conditions, depth, and rock mass strength. The load on the pillar is calculated based on tributary-area load (TAL), that is, the load on a pillar is equal to the total load halfway between the nearest supports. TAL is calculated as follows:

$$TAL = (PW + SW)\ d \times \gamma,$$

where

TAL = tributary area load

PW = pillar width

SW = stope width (82 ft.)

d = depth below surface (300 ft.),

and

γ = density of overburden (1615 lb./ft^2).

Pillars at McFadden Peak should be oriented with their long axes down the dip of the vein, because of the high potential for failure along joints parallel to the orientation of the vein, as discussed in the Rock Mass Strength section of this report. Therefore, pillar lengths will equal the dip length mined, around 300 ft. For long pillars, that is, pillar length at least 3 times the width, the stability of the pillar depends on pillar height and width. Pillar height will equal

the stope height, which for this study is 10 ft.

Using A. H. Wilson's (1978) pillar analysis, the load-carrying capacity of a long pillar was calculated for different pillar widths and spacing properties (Figure A-7). Through plotting the tributary area load for different pillar widths and stope widths, pillar widths with greater load-carrying capacity than the tributary area load should be stable (Figure A-7).

For an 82 ft. wide stope, a 19 ft. wide pillar would be required for the lowest strength properties, and an 11 ft. wide pillar would be required for the strongest strength properties (Figure A-7). Until additional strength testing is made, the choice of pillar dimension is mainly done through engineering judgment and operational considerations. For initial layout, an 18 ft. wide pillar for 82 ft. wide stopes, should be sufficient.

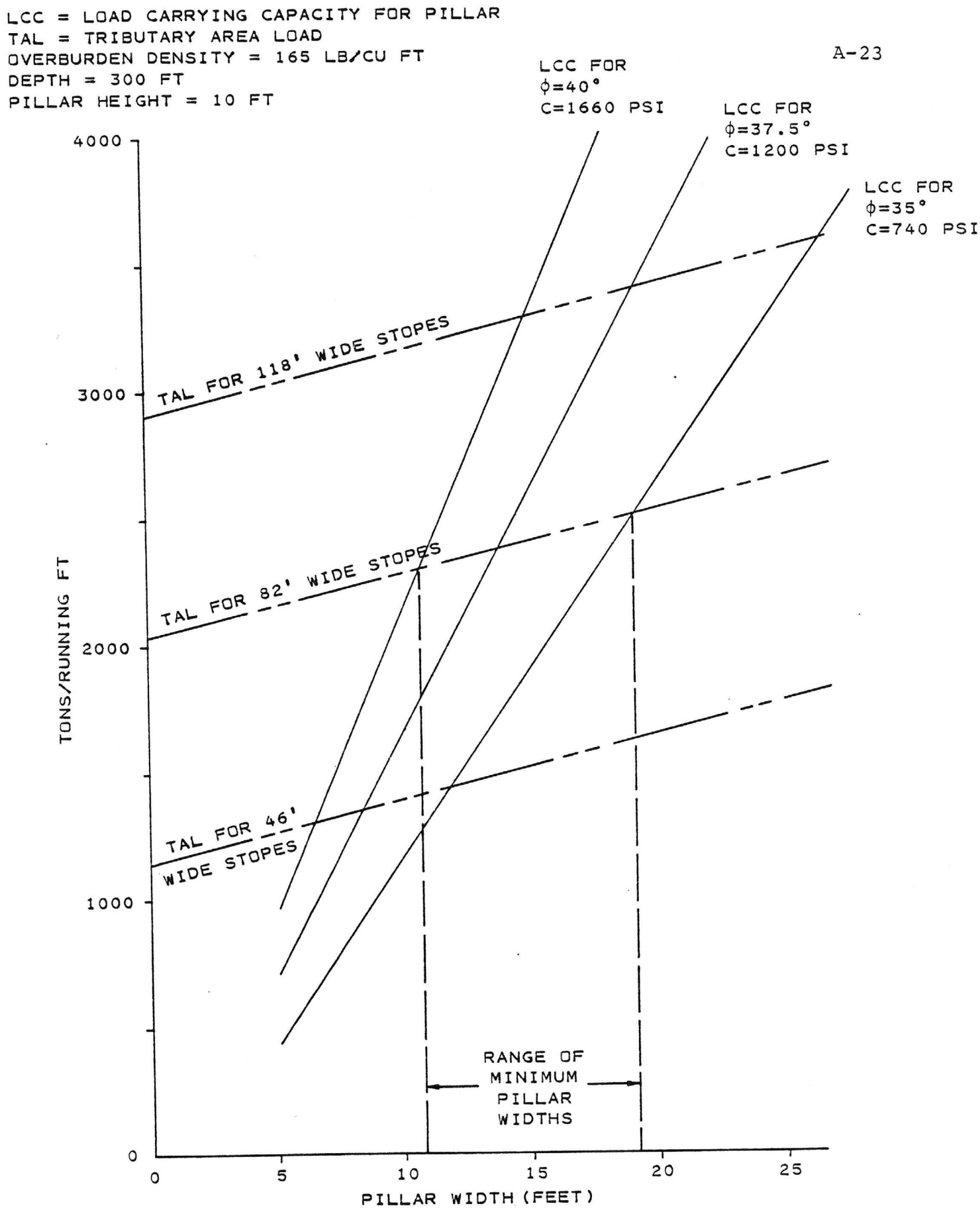


Figure A-7: Curves for Determining Pillar Width

DRILL HOLE LOGS - WORKSHEETS

KEY TO DRILL HOLE LOGS

AET	Acid etch test
Brn	Brown
Bx, bx	Breccia, brecciated
cgl	Conglomerate
chlor	Chlorite
co gr	Coarse grained
CuOx	Copper oxide minerals
Db	Diabase
dgy	Dark gray
FeOx	Iron oxide minerals
fi gr	Fine grained
frags	Fragments
gy	Gray
Hnfls	Hornfels
lamin	Laminations
Lgy	Light gray
med gr	Medium grained
MnOx	Manganese oxide minerals
qz	Quartz
Qzt	Quartzite
Sptd Hnfls	Spotted hornfels
Ss	Sandstone
Vlts	Veinlets
X-lamin	Cross laminated
Yel	Yellow

McFadden Peak Fluorspar DRILL HOLE LOG

COORDINATES		COLLAR ELEV.			HOLE NO.
NORTH 11,005 FT.	EAST 9,045 FT.	5891 FT. N 6° W INCL -45°	~~MAPER ELEV.~~ T.D. 165'		T-1
PROJECT NUMBER 135.01	DATES DRILLED 6-26-78 7-4-78	~~ELEV.~~ LOGS RUN AET 142' -48°	LOGGED BY W.C. Peters		
DRILL RIG Longyear 44	HOLE DIAMETER NX	DRILL ~~SIZE~~ ~~MEDIUM~~ DDH	DRILLER Longyear C. Edlund.		PAGE NO. 1 OF 4

(FT.) DEPTH	GRAPHIC LOG	SAMPLE NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	~~DRILL TIME (MIN)~~ RQD %	REMARKS
5, 10		Box No. & broken zone notes	Soil and boulders, with some diabase boulders			
15, 20		1 Gouge	14-58' Q3t, buff to dgy, thin laminated. Fi-med gr. Arkosic. Occ'l dgy bands w/ orbicular (1 mm) light blebs beginning at 14' & incr. to abundant (50%) at 23-58'. Rock is "Spotted Hornfels" at 32-40'.	96	22	Bddg 35-45° to axis; 20, 45, 45; FRACTURES TO AXIS
25, 30		2 red-br FeOx, clay	Argillite, dgy, zone at 42-45'	99	38	Bddg 40-50°; 40, 30
35, 40		3	Q3-cemented bx at 14-23' & 45-50'	91	17	Bddg 45°; 60, 30
45		4 FeOx 5	Irreg. yel-brn-red jasper zones on frs.	100	59	Bddg 50°; 50, 50; Yel-brn FeOx

PINCOCK, ALLEN & HOLT INC

McFadden Peak Fluorspar DRILL HOLE LOG

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-1
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 2 OF 4

PINCOCK, ALLEN & HOLT INC

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	~~DRILL TIME (MIN)~~ RQD %	REMARKS
55		Box 5 red-br FeOx, Clay		76	15	40 / 40
60		6	58-91' Qzt, pink to dgy. Fi-med gr, weakly laminated 58-68'. Strong thin lamin. 71-91' Arkosic. Few dgy bands w/ blebs at 58', incr. to abundant w/ lgy & dgy blebs at 71-91'. Cross laminated at 75'-84' Irreg. yel-red jasper on fractures.			Bddg 45°
65		red-br FeOx, clay				Waterloss 60-70'
70		7		89	10	
75		8		79	35	Bddg 50°
80						70
85		9		74	14	Bddg 45°
90						
95		br FeOx, Clay	91-111' Interbdd Qzt & "Spotted Hnfls". Qzt is white to pink, thin lamin, fi gr. Hnfls is yel-brn-red. Qzt is argillic with	97	32	45 / 45 (beds)
		10 red clay				

McFadden Peak Fluorspar

DRILL HOLE LOG

PINCOCK, ALLEN & HOLT INC

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-1
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 3 OF 4

DEPTH	GRAPHIC LOG	-	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	~~DRILL TIME (MIN)~~ RQD %	REMARKS
		Box 10 red clay	Pseudochannels(?), Cataclastic struct, Cross-laminations, & contorted bddg.			Losing circulation at 80-110 one sack Hy-Seal
105		11		92	32	40 ← → 50 (beds)
110			111-130' Qzt, lgy to yel-brn. Fi gr, thin bdd, w/ minor dgy bands. Argillic matrix. Orthoqzt texture to 118. Metaqzt texture 118-130. Occasional zones of blebs. Cross laminated.			
115		12		91	33	40 → 30
120						Losing 50% Circul'n-mud-at 120-140.
		13		35	35	
				47	0	
125			bx white-purple fluorite veinlet 127-127.2' ∠ 55°.	76	27	Bddg 40-55°
	MnOx br-yel FeOx		bx lgy fluorite-qz at 130-131.			
130				80	0	
		14 Spls 130-31 131-32 132-35 136-140	130-140 Fluorite → white to lt green. Co gr, bx, w/ healed frs. Minor FeOx, MnOx. Few frags of Qzt at 135-136'	50	8	40 30 Chlorite-yel FeOx
135				28	10	Upper Member Dripping Spring
140			140-165' Qzt. Lgy-pink. Med-co gr, hard. Feldspathic-micaceous. Orthoqzt texture with qz cement. Massive. Blebs (1-3 mm) of FeOx & dgy micaceous mineral	100	85	Middle Member Dripping Spring
145		15		95	69	Losing 75% Circulation 132-165

McFadden Peak Fluorspar

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-1
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 4 OF 4

PINCOCK, ALLEN & HOLT INC

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	~~DRILL TIME (MIN)~~ RQD %	REMARKS
		Box 15				50
155		16		100	78	Bddg 55°
160			Pebble (qz-argill) Congl. at 160-163. Dgy Argillite 163'.			40 40 weak FeOx
		17		100	42	
165			TD 165' AET @ 142' -48°			

Core No	ASSAYS Interval	CaF_2 %	SiO_2 %	$CaCO_3$
201	130-131	14.8	80.6	2.0
202	131-132	88.2	7.45	2.0
203	132-135	81.8	11.79	2.3
204	136-140	86.0	7.63	2.3
205	132-135 (Dupl.)	80.8	13.15	2.0

Sludge taken (poor sludge return) 130-140.

Assays by Tonto Mining & Milling Co.

Mc Fadden Peak Fluorspar DRILL HOLE LOG

COORDINATES		COLLAR ELEV. 5892 FT N 6° W INCL −70°	~~WATER ELEV.~~ T.D. 205 FT	HOLE NO.
NORTH 11 005 FT	EAST 9045 FT			T-2
PROJECT NUMBER 135.01	DATE DRILLED 7-4-78 / 7-13-78	~~E~~ LOGS RUN AET 150 FT = 65° 190 FT = 65°	LOGGED BY W.C. Peters	
DRILL RIG Longyear 44	HOLE DIAMETER NX	DRILL ~~ING MEDIUM~~ DDH	Longyear DRILLER C. Edlund	PAGE NO. 1 OF 5

DEPTH	GRAPHIC LOG	Box No.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	~~DRILL TIME (MIN)~~ RQD %	REMARKS
5, 10		Box No. & broken zone notes	Soil and boulders			Bottom of casing ravelling at 13'.
15, 20, 25		1	13 - 26.4' Q3t, lgy-dgy-buff, thin lamin & X lamin, fi gr, feldspathic w/ occ'l dgy bands of spotted Hnfls (broken pieces)	60	0	Casing reset, cemented at 26.4. 26'-31' cement 1 sack
30, 35		2 Red FeOx	26.4-57 Q3t, lgy-buff, thin lamin, fi gr to med gr, argillic, w/ thin bands of spotted Hnfls, lgy w/ dgy spots. Q3t & Hnfls weaky pyritic & w/ FeOx spots.	63 / 91 / 48	33 / 57 / 20	Bddg 70° to axis. →15° FRACTURES, To AXIS.
40, 45		3	SiO_2-healed breccia 40-52'	95	66	2 sacks cement, Losing Circulation 44-45'
		4		86	69	10 ↙ →15 ↓ 20 FeOx, gypsum

PINCOCK, ALLEN & HOLT INC

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-2
PROJECT NUMBER 135.01	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 2 OF 5

PINCOCK, ALLEN & HOLT INC

DEPTH	GRAPHIC LOG	Box No	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
55						Bddg 65-70
60		5	57-104 Q3t & Hnfls, banded. Q3t is lgy-pink fi-med gr, pyritic, w/ green clots & FeOx clots. Hnfls is lgy-dgy-pink-brown, fine lamin & X-lamin, locally spotted	78	74	→20
65	Red FeOx	6		94	58	Bddg 60-70°
70						40 ← →20
75		7		86	56	losing 50% circulation 75-95
80						Hole caving 75-96
85		8		74	10	
90	Gouge, minor FeOx, Mn Ox					60 ↑ →20 MnOx, gouge, weak FeOx 90-96' caving hole
95		9		78	24	Bddg 60-65° 1 sack cement 2 sacks sealcmt

DRILL HOLE LOG

PINCOCK, ALLEN & HOLT INC

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-2
PROJECT NUMBER 135.01	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 3 OF 5

DEPTH	GRAPHIC LOG	Box No.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
105		10	104-139 Spotted Hnfls, Lgy-l brn Fine lamin, x-lamin (braided)	91	65	Bddg 65°
110		Gouge, Bx, Minor FeOx				
115		11	at 115', qz veinlet (5mm) w/ fluorite boxwork, at 35° to axis	82	28	25 →10 FeOx MnOx
120						50 ← ‖ → 60 (beds)
125		12		96	38	
130			at 131', qz veinlets (1 mm), 50° to axis. Spots in Hnfls decreasing to trace at 134-139.			
135		13		79	51	
140		Brown FeOx	139-151 Qzt, Lgy w/few dgy bands, fi-co gr.			
		14		61	23	Bddg 65°
145			at 144, qz-spar Vlt (10 cm) white bladed boxwork of fluorite with qz walls, 20° to axis.			→20

DRILL HOLE LOG

COORDINATES				
NORTH	EAST	COLLAR ELEV.	WATER ELEV.	HOLE NO. T-2
PROJECT NUMBER 135.01	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 4 OF 5

DEPTH	GRAPHIC LOG	Box No.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
155, 160		15 minor FeOx; Sple 161-163	151-161, Qzt, Lgy-pink w/dgy bands, fi gr, & Spotted Hnfls, Lgy-dgy, interbedded.	67	24	0 qz, brown FeOx, red gouge; Bddg 65°
165		16 Sples 163-64, 164-66, 166-68, 168-70, 170-72, 172-74.5, 174.5-77.5, 177.5-79.5	161-168 Qzt-fluorite bx, spar cement, vuggy	90	90	10-15 FeOx MnOx
170			168-170, Qzt, med gr, and fi gr. fragments (wall cave)	57	27	Zone of Core loss (core ends ground)
175		L brn FeOx	170-179.5 Fluorite, Lgy-L blu-Lgreen, massive, Xline, w/ occ'l FeOx blebs & minor vugs. End of core ground at 179.5'	72	41	
180		17 Sple 179.5-184.5	179.5-184.5 Fluorite in bx frags w/ brown gouge.	100	35	70, 70
185			184.5-205 Qzt, Lgy-buff, med-co gr, arkosic, w/ faint gray banding. Bddg indistinct.	55	05	Upper Member Dripping Spring — — — Middle Memb. Dripping Spring
190, 195		18	at 195', qz vein (5 mm)	90	20	

DRILL HOLE LOG

COORDINATES				
NORTH	EAST	COLLAR ELEV.	WATER ELEV.	HOLE NO.
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	T-2
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 5 OF 5

DEPTH	GRAPHIC LOG	Box No.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	~~DRILL TIME (MIN)~~ RQD %	REMARKS
		19		100	46	
205						
			TD 205'			
0			AET 150' -65°			
			190' - 65°			
5		Core	Assays %			
		No	Interval CaF_2 SiO_2	$CaCO_3$		
0		212	161-163' 2.6 94.13	1.0		
		213	163-164' 1.6 93.82	2.7		
		214	164-166' 2.9 92.87	2.7		
5		215	166-168 25.0 70.61	2.7		
		216	168-170 3.4 91.86	2.0		
		217	170-172 61.5 32.62	2.3		
0		218	172-174.5 75.7 19.04	3.0		
		219	174.5-177.5 57.6 37.93	3.0		
5		220	177.5-179.5 64.8 30.19	2.7		
		221	179.5-184.5 39.9 53.12	4.0		
		222	177.5-179.5 66.8 28.11 (Duplicate)	3.0		
0						
			Sludge taken, not assayed 161-184.5			
5			Assays by Tonto Mining & Milling Co			

PINCOCK ALLEN & HOLT INC

1978

Longyear 44 | LED 7-25-78 | 13W incl. -75° | T

HOLE DIAMETER NX | LOGS RUN AET 100FT=71° | LOGGED BY W.C.

DRILL DDH | Longyear DRILLER C.E

DEPTH	GRAPHIC LOG	Box NO. & Broken Zone Notes	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %
5			0-72' Overburden, soil and boulders. At 71-72', mixed fragments of Qz+ pink, med gr, cm'd Hnfls, dgy.		
10					
15					
20					
25					
30					
35					
40					
45					

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McFadden Peak Fluorspar

DRILL HOLE LOG

COORDINATES			
NORTH	EAST	COLLAR ELEV.	WATER ELEV.
PROJECT NUMBER 135.01	DATE DRILLED	E-LOGS RUN	LOGGED BY
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILL

DEPTH	GRAPHIC LOG	Box	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	
55, 60, 65, 70					
75		Box 1 Spl es 73-74' 74-76'	72-76' Fluorite, lgy-l green, co xlline, bx, FeOx lamellae.	35	2
80			76-100' Spotted Hnfls, lgy-dgy-tan, fi lamin, w/ contorted lamin. & X-lamin. Mud cracks & stylolites. Weakly pyritic, w/pyrite on bedding planes. Occl zones of fi gr Qzt	87	5
85		2 Red-blk FeOx, MnOx		100	50
90					
95		3		95	73

Mc Fadden Peak Fluorspar

DRILL HOLE LOG

PINCOCK, ALLEN & HOLT INC

COORDINATES		COLLAR ELEV. 5906 Ft. Vertical.	T.D. 164 FT.	HOLE NO. T-4
NORTH 10 955 FT	EAST 10 343 FT			
PROJECT NUMBER 135.01	DATE DRILLED 7-26-78 8-1-78	LOGS AET RUN 154' = 90°	LOGGED BY W.C Peters	
DRILL RIG Longyear 44	HOLE DIAMETER NX	DRILL DDH	DRILLER Longyear C. Edlund	PAGE NO. 1 OF 4

DEPTH	GRAPHIC LOG	BOX NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
		& broken zone notes	0-31' Overburden, soil, & boulders. Most rock frags Q3t - Arkose, pink, massive, x-bdd (Troy Q3t.) From 25-31', frags mixed Hnfls, tan, spotted, fi gr, fi lamin and Q3t-Arkose.			
		Box 1		84%	0	
		2		96	10	
		brn Feox, clay 3	31-68 Hnfls, buff-brown, spotted, interbedded w/ thin Q3t beds, tan-L brn, med-fi gr. Argillite galls & abund clay-filled frs 31'-37'. Hnfels coarsens to med gr tan rock w/ dgy spots 45'-55'	100	43	Bddg 80° to axis; →20° FRACTURES To AXIS
		4		100	32	

5 10 15 20 25 30 35 40 45

DRILL HOLE LOG

PINCOCK ALLEN & HOLT INC

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-4
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 2 OF 4

DEPTH	GRAPHIC LOG	NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
						Bddg 85°
55		5		98	56	30 / 18 / 30
60						Bddg 80°
65		6		90	50	
70			68-72.5' Q3t, white to tan, fi gr., massive			15 FeOx
		Gouge				
75		7	72.5 – 91 Q3t, Lgy-brn, figr, lamin; w/ Hnfls, Lgy-dgy, lamin, spotted. Hnfls has network of fi frs filled w/ dgy material. Hnfls is X-lamin. Red-brn FeOx blebs & splotches 82-91'.	100	67	Bddg 80°
80						
		8		100	52	
85		FeOx Gouge				
90						
		9	91-125 Q3t tan-dgy, fi_med gr, lamin, w/ Hnfls, tan-dgy, lamin, w/ X-lamin & w/ small load casts.	100	46	Bddg 70-85° X-bdd
95		FeOx Gouge				15 FeOx
		10				

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-4
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 3 OF 4

DEPTH	GRAPHIC LOG	NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
105				100	47	
110		11		88	29	
115						
120		12		100	46	10-15
125		13 Light Gouge	125-150 Hnfls, Lgy-dgy, spotted, lamin., w/ minor Qzt., tan, fi gr, thin bdd. X-lamin & load casts in Hnfls.	100	35	Bddg 80°
130						
135		14		90	55	45 / 10 / 25
140						
145		15 Bx, Gouge		100	48	

PINCOCK, ALLEN & HOLT INC

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-4
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 4 OF 4

DEPTH	GRAPHIC LOG	NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
155		16	151-157, Hnfls, Lgy-dgy, spotted, massive (thick bdd)	100	67	
160		17	157-164, Hnfls, Lgy-dgy, spotted, lamin, w/ minor Qzt, tan, fi gr, thin bdd.	100	53	
5			TD 164'			
			AET 154 -90°			
0						
5						
0						
5						
0						
5						

PINCOCK, ALLEN & HOLT INC

McFadden Peak Fluorspar

DRILL HOLE LOG

COORDINATES		COLLAR ELEV. N 10° W, 70° 5890 Ft.	TD 426'	HOLE NO.
NORTH 10,808 Ft	EAST 9,471 Ft			T-5
PROJECT NUMBER 135.01	DATE DRILLED 8-2-78 8-22-78	LOGS RUN AET 420' 72°	LOGGED BY W.C. Peters*	
DRILL RIG Longyear 44	HOLE DIAMETER NX	DRILL DDH	Longyear DRILLER C Edlund	PAGE NO. 1 OF 7

DEPTH	GRAPHIC LOG	Box NO. & Broken Zone Notes	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
5, 10, 15			Soil and boulders			(*Scout log 334–426 by J.W. Cameron) Caving at bottom of casing, 16 Ft.
20, 25		1	16–38' Hnfls, spotted, dgy, interlamin w/ Hnfls & Argillite, Lgy, & Qzt, Lgy. x-lamin, w/ occ'l pellet texture & occ'l chlorite blebs. Hnfels is pyritic (up to 1% dissem & in blebs) from 16 to 27'. Load casts 34–38'.	100	52	Bddg 70° to axis; 45 Brn-blk FeOx FRACTURES TO AXIS
25, 30		2 FeOx		98	40	20 FeOx
35		3		90	50	
40			38–43, Hnfls, Lgy-tan, med gr texture interval			30 10 FeOx
45		4	43–46 Hnfls, spotted, dgy, & Qzt, figr, Lgy	100	98	
			46–49 Hnfls, spotted, Lgy, & Qzt, figr, Lgy			

PINCOCK, ALLEN & HOLT INC

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-5
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 2 OF 7

DEPTH	GRAPHIC LOG	SAMPLE NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	DRILL TIME (MIN)	REMARKS
55		5	49-58 Hnfls & Argillite, Lgy-dgy, lamin. w/ abu dgy cracks & Vlts.	100	89	Bddg 70°
60			58-69 Qzt, Lgy, fi gr. & Hnfls, lgy-buff, mottled (med gr. texture)			40 ← → 20 FeOx
65	XX	6 Heavy FeOx MnOx, Gouge		94	71	Bddg indistinct
70		7	69-81 Qzt, pink-red, fi gr. massive. Incompletely cemented. Bleached (yel-brn) zones along fractures.	94	61	
75						→ 20
80		8	81-87, Qzt, Lgy, fi gr & Hnfls, Lgy-buff, mottled (med gr.)	100	68	
85						
90		9	87-105 Hnfls - Argillite, Lbrn-dgy, lamin, slightly pyritic, with minor interlamin Ss, fi gr, micaceous.	100	78	Beddg 70°
95		Gouge				70 ← → 40 Red FeOx spreading from fractures.
		10 Brn-Yel FeOx		85	20	

PINCOCK, ALLEN & HOLT INC

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-5
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 3 OF 7

DEPTH	GRAPHIC LOG	SAMPLE NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	DRILL TIME (MIN)	REMARKS
		Gouge				
105			105-117 Hnfls, spotted, Lgy-dgy w/ larger dgy blebs, massive (non-lamin.)			
		11		93	63	→40 ↓50 brn-yellow FeOx
110						
115						
		12	117-128 Hnfls, Spotted, Lgy-dgy, w/ dgy blebs. Lamin & x-lamin (braided) w/ load casts, pellets, & dgy cracks.	100	88	
120						→70
125		13		100	42	
			128-134 Hnfls, Lgy-dgy, fi gr, lamin, w/ braided lamin & abu pellets.			
130						
135		14	134-140, Qzt, Lgy-dgy, fi gr, lamin, w/ minor Hnfls, Lgy-dgy, lamin, braided, w/ pellets.	100	46	Bddg 80°
						→30
140			140-155 Qzt (Ss), pink, fi-med gr, massive. Arkosic, locally chloritic, w/ few dgy argillite zones			
		15		100	30	
145						→25-40

PINCOCK, ALLEN & HOLT INC

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-5
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 4 OF 7

DEPTH	GRAPHIC LOG	SAMPLE NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	DRILL TIME (MIN)	REMARKS
		16		98	34	
155			155-160 Hnfls, Lgy-dgy, lamin & braided, w/ Q3t, pink, fi-med gr, arkosic, thin bdd.			Upper Member
160						Dripping Springs Q3t
		17	160-173 Q3t (Ss) Lgy-pink, med gr, massive	85	45	Middle Memb.
165						60 → 30 Lbrn FeOx
170		18		100	46	Bddg 70°
175			173-205 Q3t, Lgy-pink, med gr, arkosic, massive.			→ 30 weak Lbrn FeOx
180		19		100	95	
185						→ 35-50 weak Lbrn FeOx
		20		100	56	
190						
195		21		100	62	

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-5
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 5 OF 7

PINCOCK, ALLEN & HOLT INC

DEPTH	GRAPHIC LOG	SAMPLE NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	DRILL TIME (MIN)	REMARKS
205		22	205 – 231 Q3t, gray, med-co gr, arkosic, massive, w/ few lenses of pebble cgl & occ'l bands of argillite (dgy).	90	57	
210						
215		23		100	51	Bddg 75° (faint)
220						
225		24	at 231 thin bands of spotted Hnfls, red.	100	60	04 ↓70 →40 weak yel-brn FeOx
230						
235		25	231 – 251 Q3t, pink-red, med gr to co gr, arkosic, massive. w/ zones of pebble cgl.	72	21	Bddg 70° Losing Circulation 24 – 262
240		brn FeOx, Gouge				
245		26		100	31	→40 weak brn FeOx 241-247 2 sacks sealant 1 sack cement

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-5
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 6 OF 7

PINCOCK, ALLEN & HOLT INC

DEPTH	GRAPHIC LOG	SAMPLE NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	DRILL TIME (MIN)	REMARKS
		27	251-267 Φ3t, pink, fi-med gr, arkosic, thin bdd to massive	100	35	Bddg 80°
255		weak FeOx				
260		28		93	54	
265			267-299 Φ3t, pink-red, med-co gr, arkosic, massive, w/ pebble cgl zones 281-290.			
270		29		100	61	
275						→30
280		30		94	40	Bddg 70°
285		brn FeOx, Gouge				
290		31		94	47	
295						
		32		100	42	

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-5
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 7 OF 7

DEPTH	GRAPHIC LOG	SAMPLE NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	DRILL TIME (MIN)	REMARKS
305			299-325 Q3t, pink, med gr, massive			
310		33		88	32	
315						
320		34 weak FeOx, Gouge		96	05	322' 1 sack Sealant
325		35 Q3 Vlts, Vuggy	325-334- Q3t, pink, med gr., massive, w/ intersecting q3 veinlets, (vuggy q3)	80	27	
330						Losing Circulation 330-347'
335	SCOUT LOG 334-426		334-401 Q3t, red, fi-med gr. w/ laminae of figr Ss, interbdd w/ pink & white Q3t laminae Grading to Q3t, red-brown med gr, xbdd			Bddg steepens (30°)
340			355-58 Q3 veins 1/16" 358-400 Q3 veins 1/4", more intense			
345	400'	Fa, Q3	400-402 1" Q3 vein & 4 1/4" Q3 veins.			(Vein Q3 @ 400')
			400-426 V fi gr Q3t - pink - tan, w/ laminae of fi gr. Ss 413 - 3/8" Q3 vein			

TD - 426.

PINCOCK, ALLEN & HOLT INC

McFadden Peak Fluorspar

DRILL HOLE LOG

PINCOCK, ALLEN & HOLT INC

COORDINATES		COLLAR ELEV. 5870' N 12 E Incl. -60°	TD 211'	HOLE NO.
NORTH 11,010	EAST 8,308			T-6
PROJECT NUMBER 135.01	DATE DRILLED 8-24-78 / 9-11-78	LOGS RUN AET 200' 610°	LOGGED BY J.W. Cameron	
DRILL RIG Longyear 44	HOLE DIAMETER NX	DRILL DDH	DRILLER Longyear C. Edlund	PAGE NO. 1 OF 5

DEPTH	GRAPHIC LOG	Box NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD	REMARKS
			Alluv.			(Log transcribed by W.C. Peters & rewritten)
5		1	4-35' Q3t, argillic, or-brn to green, thin-med lamin. Fi-med gr. w/ small spots of oxidized mafics. Or-brn bleeding along fracts & lamin. Laminated = 50% of Core	90	70	
10						
15		2				Bddg 35-55° to axis
						Fractures 40° to axis
20						
		3				
25						
30		4				
35			Q3t 35-42' variety of light tan colors, fi gr, lamin. Few spots at 41'	100	50	Pink marker sand of argillite-Q3t base (bottom of upper member) ?
40		5				
			Q3t 42-65' med gray w/ pink & white laminae. Fi-med gr. 1-2% biot & chlor. v little K-spar Thin lam, thick to massv. bddg	100	70	gray Q3 of Middle Member ?
45		6				

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-6
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 2 OF 5

DEPTH	GRAPHIC LOG	SAMPLE NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	DRILL TIME (MIN)	REMARKS
55			As above			Bddg 40° Fractures 50°
		7				
60						
65		8	Qz+, 65-114' gy-pink, med gr. thin lamin w/ 20% pink feldspar. X-lamin. Thick to massive bddg.	100	70	Gray Qz+
70						Fractures 50° w/ 6" average spacing
75		9				
			← blocky mafic patches			Bedding 60°
80						
85		10				
90			← blocky mafics 93-97'			
		11				
95						
			4" weak conglomerate @ 100'			

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-6
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 3 OF 5

DEPTH	GRAPHIC LOG	SAMPLE NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	DRILL TIME (MIN)	REMARKS
		12	As above			Gray Qzt
105			Fi gr red sandy Qzt			
110		13	sandy fi gr pink Qzt marker zone			
115			114-152 Qzt, pink-gray med-co gr, thin lamin. 35% K spar w/ 2-3% of 1/4" pebbles. Blocky bedding	100	75	Gray Qzt
120		14				Losing Circul. 121-156 2 sacks sealant
125						Bedding 60°
130		15	red fi gr. sand lens			Fractures 55° @ 1' spacing
135			1' conglomerate zone (< 1/4") w/ med gr. Qzt			
140		16	6" argillic zone			
145		17				

PINCOCK, ALLEN & HOLT INC

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-6
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 4 OF 5

DEPTH	GRAPHIC LOG	SAMPLE NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	DRILL TIME (MIN)	REMARKS
			As above			bottom of Gray Q3t
155		18	152-163.5 Q3t, pink, fi gr, thin lamin. of white & pink Q3t w/ K spar	95	20	Top of red Q3t of Middle Member Bedding 50°
160		Broken.				
165		Spies 19 163.5-166 166-168	163.5-170.5 Breccia of red Q3t w/ black-lined vugs (5%) after Pb-Zn sulfides, Little or no CaF2 - may have been leached out ±5%	90	45	
170			170.5-192 Q3t - Pink - buff, fine gr, thin lamin. X-lamin. Light color may be bleaching	95	40	Losing Circulation 171-186 2 sacks sealant
175		20				
180						Fractures 50° w/ 6" spacing
185		21				Bedding 50° to 60°
190						
195		22	192-211 Q3t, pink-red, fi-med gr. thin lamin w/ med. bedding, X-lamin. K-Spar = >60% 198' Argillic zone	100	40	

PINGOCK, ALLEN & HOLT INC

DRILL HOLE LOG

COORDINATES		COLLAR		HOLE NO.
NORTH	EAST			T-6
PROJECT NUMBER	DATE DRILLED		LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILL	DRILLER	PAGE NO. 5 OF 5

DEPTH	GRAPHIC LOG	BOX NO. & BROKEN ZONE NOTES	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
205		23	weakly conglomeratic			
210						
5			TD = 211' AET 200' - 61°			
0		No 233 234	CORE ASSAYS Int. CaF2 % 163.5-166 0.04 166-168 0.04			
5			Assays by Skyline Labs.			
0						
5						
0						
5						

PINCOCK, ALLEN & HOLT INC

1978

McFadden Peak Fluorspar

DRILL HOLE LOG

COORDINATES		COLLAR ELEV. 5865' N 5° W -57°	T.D. 301 Ft.	HOLE NO.
NORTH 10,730'	EAST 10,121'			T-7
PROJECT NUMBER 135.01	DATE DRILLED 9/12/78 10/11/78	LOGS RUN AET 301' -61°	LOGGED BY W.C. Peters	
DRILL RIG Longyear 44	HOLE DIAMETER NX	DRILL ~~ING~~ ~~MEDIUM~~ DDH	DRILLER Longyear C. Edlund	PAGE NO. 1 OF 7

DEPTH	GRAPHIC LOG	Box No. & Broken Zone Notes	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
5, 10, 15, 20, 25, 30, 35, 40, 45		1, 2, 3, 4	0-64' overburden Soil and Troy Qzt boulders to 61' Soil & bonded argillite boulders 61-64'.			

PINCOCK, ALLEN & HOLT INC

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-7
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 2 OF 7

PINCOCK, ALLEN & HOLT INC

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
55, 60		5				@ 70' cemented
65, 70, 75		6, 7	64-123' Argillite & Hnfls, lamin, spotted, Lgy-buff-dgy w/ shrinkage cracks, load casts X-lamin.	80, 86	8, 22	yel-brn to red-brn FeOx bleeding on fractures. Bddg 60-65° to axis
80	brn FeOx, Clay					
85, 90	brn FeOx, Clay	8		75	24	25← →60 →25 yel-brn FeOx Fractures, to axis
95	brn FeOx, Clay	9		98	33	85-105' 5 sacks sealant

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-7
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 3 OF 7

PINCOCK, ALLEN & HOLT INC

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
105		brn FeOx, minor clay				Hole caving
		10		100	59	Bddg 60-65°
110						
115						on beds, brn FeOx, pyrite voids
		11		100	60	60 / 30-V / brn FeOx / brn FeOx
120						
125			123-132 Fi. gr. Qzt, buff-gy to brn. Faint lamin., mottled, few spots. Shrinkage cracks			
		12 red-brn FeOx, clay		100	20	Bddg 55-65° Hole caving
130						
135			132-137 Qzt, gy, micaceous. Non-lamin. Slightly pyritic. Shrinkage cracks.			red-brn FeOx bleeding on frs.
140		13 red-brn FeOx	137-194 Hnfls, gy, spotted, lamin, x-lamin. Load casts	100	24	Hole caving yel-red FeOx bleeding on frs.
145						
		14 red-brn FeOx		95	38	

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-7
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 4 OF 7

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
155						
		15		90	19	
160		red-brn FeOx				
165		red-brn FeOx, CuOx				
		16		100	56	
170						
175		17		100	50	Bddg 55-65°
180						
185		18		97	57	
190						
195		19 brn FeOx	194 - 211 Qzt, Lgy-pink, fi gr. with minor Hnfls	71	07	196-209 caving - 2 sacks sealant

PINCOCK, ALLEN & HOLT INC

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DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-7
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 5 OF 7

PINCOCK, ALLEN & HOLT INC

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
205		20	Qzt, lgy-pink, fi gr w/ minor Hnfls, dgy lamin. Load casts, shrinkage cracks, X-lamin, stylolites. Weakly spotted.	65	09	
210		red-brn FeOx	211-220 Qzt, Lgy, fi-med gr, orthoqzt w/ faint spots & faint laminae.			
215		21		69	03	Bddg 70°
220	?		220-222 VOID			
225		22	222-238 Qzt, Lgy-pink fi-med gr, arkosic, w/ faint banding. Minor lenses of Argillite, dgy, 1 mm qz vlts w/ red-brn FeOx & pyrite voids, in argillite at 222'	90	13	30 50 red-brn FeOx
230						231-249' 2 sacks sealant
235						
240		23 red-brn FeOx, trace CuOx	238-283 Qzt, Lgy-L. pink, fi to co gr. w/ occ'l pebble zones, unsorted, faintly lamin. Blotchy. Occ'l 1 mm qz vlts	60	03	Bddg 65°, indistinct
245						

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-7
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 6 OF 7

PINCOCK, ALLEN & HOLT INC

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
255		24		90	13	
260						
265		25	red-brn FeOx, minor clay	100	39	Beddg 65°, indistinct.
270		26		100	06	
275			red-brn FeOx, minor clay			
280		27		100	44	
285			283-301 Qzt, gy-pink fi-co gr, unsorted, w/ occ'l pebble conglomerate. No laminn.			
290		28		100	13	
295						
		29		100	25	

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-7
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 7 OF 7

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
301			TD 301'			
			AET 301', -61°			
5						
0						
5						
0						
5						
0						
5						
0						
5						

PINCOCK, ALLEN & HOLT INC

McFadden Peak Fluorspar

DRILL HOLE LOG

PINCOCK, ALLEN & HOLT INC

COORDINATES		COLLAR 5912' N 1° E -63°	TD 161'	HOLE NO. T-8
NORTH 11,046'	EAST 7,430'	LOGS RUN AET 140' -61°	LOGGED BY J. W. Cameron	
PROJECT NUMBER 135.01	DATE DRILLED 9/10/78 to 9/20/78	DRILL ~~ING~~ ~~MEDIUM~~ DDH	DRILLER La chance	PAGE NO. 1 OF 4
DRILL RIG Longyear 44	HOLE DIAMETER NX			

DEPTH	GRAPHIC LOG	Box No. & Broken Zone NOTES	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
			Argillic Qzt of upper member (#1 zone)			Log transcribed & rewritten by W.C. Peters. Rock bit to 4.5'
5		1	Qzt, tan to gray, fi gr., sandy, w/ x-lamin. Conglom at 11'	100	72	
10			Argillite, L green, w/ Qzt, fi grain.			bottom Argillic Qzt
		2	13 – 30' Qzt, gy – L pink, fi gr thin lamin., w/ argill. zones @ 18' = 6" 21' = 6"	100	72	Top, gray Qzt. of middle member
15						Bedding 30° to core axis
20		3		90	36	21' water loss (fractures)
25			increasing grain size ↓			→ 45 joints to core axis
30		4	30 – 84' Qzt, gray, co-med grain with 15-30% feldspar. Thin lamin but massive bedding Locally pink Local pebble cngl.	100	49	23-53' water-mud loss 1 sack sealant
35						
40		5		100	71	
45						Bddg 30°

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-8
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 2 OF 4

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
				100	78	
55			54' = Pink fi gr. Ss, 4"			
			56' = Conglom, med-coarse one foot.			
60		7	weakly conglom.	100	64	
65						
70		8	72-73.5 blotchy zone	100	83	→80 at 72' ½" Qz vein
75						
80		9	80' weakly conglom.	100	76	several 1/8" Qz veinlets at 80'
85			84'-110' Qz+, gy-pink, fi-med gr., weakly lamin. with feldspar-clastic zone at 88' and fi gr. pink ss zone (6") at 90'			
90		10		100	81	→60° at 87.5' several 1/8" Qz veinlets
95		11		100	94	Joints with oxidized Py. ½" Qz vein at 98'

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-8
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 3 OF 4

DEPTH	GRAPHIC LOG	SAMPLE NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	DRILL TIME (MIN)	REMARKS
105		12	laminated, but with massive bedding	100	83	1" qz-py vein at 106
110			110' — 133' Qzt, red-tan, fi gr w/ thin lamin (< 1/8"), also gnarled & contorted 1/2" lamin.			bottom Gray Qzt. Top red Qzt.
115		13		100	100	112-140 1 sack sealant
120						
125		14		100	74	Bddg 40°
130			last few feet = bleached.			
135		15 Spls: 133-136 136-138 138-140	133 — 140' Vein = cemented Qz breccia. Little or no CaF_2. Traces of pyrite, chalcopyrite, galena, sphalerite.	85	33	Barren Vein
140		FeOx on fract's	140 — 161' Qzt. red-tan, fi-med gr. slightly lamin. Pyrite & FeOx on fractures & dissem.			Footwall = red Qzt.
145		16 solid gouge		100	0	Bedding 50°

PINCOCK, ALLEN & HOLT INC 1978

DRILL HOLE LOG

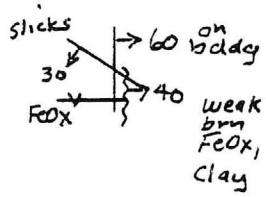
COORDINATES		COLLAR ELEV.	WATER ELEV.	HOLE NO.
NORTH	EAST			T-8
PROJECT NUMBER	DATE DRILLED	E-LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 4 OF 4

DEPTH	GRAPHIC LOG	SAMPLE NO.	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	DRILL TIME (MIN)	REMARKS
		Gouge				
		17		100	12	
155		FeOx on frs				
		Gouge	158' Cherty-looking fi gr bands. Characteristic of 150' ± below top of gy Qzt. ?			
160		weaker FeOx				
			TD 161			
5			AET at 140', -61°			
			CORE ASSAYS			
0		NO	Interval — CaF_2 %			
		235	133-136' — 0.03%			
		236	136-138' — 0.02			
5		237	138'-140' — 0.03			
			Assays by Skyline Labs			
0						
5						
0						
5						

PINCOCK, ALLEN & HOLT INC

McFadden Peak Fluorspar DRILL HOLE LOG

COORDINATES		COLLAR ELEV. 6052' N 13° E -63°	TD 211 Ft.	HOLE NO.
NORTH 11,095	EAST 6,680			T-9
PROJECT NUMBER 135.01	DATE DRILLED 9/25/78 10/13/78	LOGS RUN AET 211' -70°	LOGGED BY W. C. Peters	
DRILL RIG Longyear 44	HOLE DIAMETER NX	DRILLING MEDIUM DDH	Longyear DRILLER La Chance	PAGE NO. 1 OF 5

DEPTH	GRAPHIC LOG	Box No. & Broken Zone Notes	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
5		1	0-8' Qzt, buff-red, fi gr. & Hnfls, buff-red. Locally sptd, locally lamin	100	43	Red-dk brn FeOx bleeding on frs.
10		2	8-18' Qzt, Lgy, figr, w/ minor interlamin. Hnfls, buff-gy, sptd. Shrinkage cracks.	100	17	
15						Frs-to axis 
20		FeOx 3	18-21' Hnfls, buff-dgy, sptd, w/ irreg. lamin. & shrinkage cracks.			
25			21-26' Hnfls buff-dgy, weakly sptd, irreg. lamin., w/ Co gr Ss lenses.	100	45	Bddg 40-55° to axis
30		4	26-40' Hnfls, Lgy-yel-red, Sptd, irreg. lamin., shrinkage cracks, clay galls, pyritic,	100	61	Yel-red FeOx bleeding on frs.
35						35-53 3 sacks cement 1 sack sealant
40		5	40-75' Hnfls, Lgy-dgy, spotted, irreg. lamin. to regular lamin.	100	58	Bddg 50-60°
45						
		6		97	43	

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-9
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 2 OF 5

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
55		gouge				53-85 water loss
		7		100	77	
60						
65						Bddg 50-60°
		8		100	28	
70						
		FeOx gouge				
75		9	75-107 Qzt, Lgy-pink, arkosic, fi-med gr. w/ laminae of Hnfls dgy-red & occ'ly sptd. Irreg. banded. Common clay galls, load casts, shrinkage cracks, and unconsolid. bx & slump-fold struct.	100	43	
80						
85						Bddg 65°
		10		89	06	
		Clay				
90		Clay				60← →65 Bddg; ↓15 light FeOx
95		11		89	13	

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-9
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 3 OF 5

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
105		12	(99-107) becoming domin. Qzt - Orthoqzt, med gr with few spots & few lenses of arkosic Qzt	100	18	Bddg 65°
110			107-116 Qzt Lgy, fi-med gr. Principally orthoqzt, w/ shrinkage cracks.			
115		13		90	11	
120			116-151 Qzt, Lgy, fi-co gr, unsorted, feldspathic, w/ angular-subangular grains.			
125		14		94	9	
130						
135		15		100	45	
140		16		97	45	
145			at 150', qz vein, 2" vuggy. Minor CaF_2 casts			vein at 150' 40° to axis

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-9
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 4 OF 5

PINCOCK, ALLEN & HOLT INC

DEPTH	GRAPHIC LOG		DESCRIPTION / FIELD IDENTIFICATION	CORE REC. %		REMARKS
		17	151-152 Frags Q3, Q3t, some CaF2 casts	94	40	
		SiO2 (Spar?)	152-167.5 Q3t, Lgy, fi-co gr, locally w/ pebble cgl, poorly sorted.			Bddg 65°
155						
160		18	at 161-167.5, zone of veinlets, 1-5 mm in thickn, w/ Q3 & possible spar (minor)	78	28	
165						
		Spls 167.5-169 169-172	167.5-169 spar, Lgrn-Lpurp Xline, in 6 abraded frags	28		spar pieces 1"-3" diam.
170			169-172 Q3 & spar frags & Q3t frags, abraded.	25		25% core rec in frags. Remaind = gouge
		19	172-173 Q3t, Q3, spar frags	100	39	100% in abraded frags. 70% = Q3t 30% = Q3-Spar
175			173-205' Q3t, buff-Lgy, med-co gr., arkosic, unsorted, w/ few argillite bands & occ'l zones of pebble (angular) cgl.	83		
180						V 80 ← → 40
		20		100	62	
185						
190		21		97	48	Bddg 65°
195						

1978

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-9
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 5 OF 5

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
205			205-211' Qzt, Lgy-pink, arkosic, med-co gr., w/ faint lamin.			
210						
			TD 211'			
			AET 211', -70°			
215						
			Core Assays			
0		No.	Interval	CaF_2	SiO_2	$CaCO_3$
		238	167.5-169	98.4%	1.10%	—
		239	169 - 172	18.9%	70.38%	—
5			Skyline Labs			
0						
5						
0						
5						

PINCOCK, ALLEN & HOLT INC

1978

McFadden Peak Fluorspar

DRILL HOLE LOG

COORDINATES		COLLAR ELEV. 5805' N 2°W incl -61°40'	TD 166'	HOLE NO.
NORTH 11,000	EAST 10,960			T-10
PROJECT NUMBER 135.01	DATE DRILLED 10/12/78 10/20/78	LOGS RUN AET Not taken	LOGGED BY W. C. Peters	
DRILL RIG Longyear 44	HOLE DIAMETER NX	DRILL Rotary 0-32' DDH 32'+	Longyear DRILLER C. Edlund	PAGE NO. 1 OF 4

DEPTH	GRAPHIC LOG	Box No. & Broken Zone Notes	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
5, 10, 15, 20, 25, 30			0-32' Diabase soil and weathered Diabase			Rotary drill in Diabase to 32'
35, 40		1	32-74 Diabase, dgy-olive brn, med gr w/ brn-blk FeOx, MnOx on frs. Many frs w/ slicks. Decomposed & disintegrated to 51'. Soft but solid to 66'. Moderately hard, firm, & fresh to 74'.	100	0	1 sack sealant
45		2		100	0	

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-10
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 2 OF 4

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
55		3		100	15	45 Fractures, To axis
60						
65		4		95	17	
70						
75		5	74-76' Qzt, pink-Lbrn, med gr., arkosic w/ yel-brn FeOx spots & blotches	50	3	70 40 weak brn FeOx
80	Loose Bx, Ravell.		76-86' Frags & rolled pieces of Qzt (as 74-76') w/ minor frags of Argillite, Lbrn.			
85						
90	Bx & gouge	6	86-104.5' Diabase, mod hard, firm, w/ weakly altered feldspar.	96	23	10 50 Weak Brn FeOx
95						
	Bx & gouge	7		100	34	

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-10
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 3 OF 4

PINCOCK, ALLEN & HOLT INC

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
105		Bx & gouge	104.5-106, Bx, Diabase & clay gouge w/ 1-2 mm qz vlts			1 sack Sealant
110		8 Loose Bx, Ravell	106-117, Qzt, Lgy, fi-med gr, arkosic, w/ abu qz-filled druses. Occ'l pieces of vein qz.	47	5	All in rolled pieces; 80-90
115			117-118 Bx. Qzt frags, Lbrn in dol-calcite matrix			
120		Loose Bx, Ravell	118-121.5 Qzt, Lgy, fi-med gr, arkosic	(1.0' core 118-121.5)		"No core" block at 118'; All in rolled pieces
125		Spies 121.5-24 124-29; 9 Sugar Spar; Spies 129-32 132-35.5 135.5-36	121.5-135.5 Fluorspar, xlline, Lgy-Lgrn. "Sugar spar" 121.5-130.5 & 132-135.5	81	11	Few rolled pieces at 121.5'
130			Solid co xlline spar at 130.5-132, w/ minor CuOx green stain & few FeOx casts after py & cpy	(86% at 121.5 to 130) (91% at 130.5 to 135.5)		80-90
135		Sugar Spar; gouge	135.5-136 Gouge & "sugar spar" mixed w/ frags of Argillite, dgy			135.5-136 Latest spar is fi xlline vlts & druses. Some is Lt purpl.
140		10 Loose bx; Qz & FeOx	136-139 Qzt, Lgy. fi-med gr w/ abu 1-3 mm qz vlts & druses	71 (100% at 135.5 to 136)	8	Bddg 60° to axis
145			139-161, Qzt (page 4)			20, 60, 45 on bddg; weak red-brn-dgy FeOx-MnOx
		11		100	31	

1978

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-10
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 4 OF 4

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
155		FeOx	139-161 Qzt, med gr, L brn, w/ zones of white fi gr Qzt & few zones of spotted med gr rexllized Hnfls. Faint remnants of contorted bddg.			Bddg 60° to axis yel-brn bleeding on frs
		12		100	23	20 ↑ 50 ← → 60 ↓ 30
160						
			161-166 Qzt, buff-brn, fi gr, pyritic (dissem & blebs			yel-brn bleeding on frs.
165		13		100	75	
170			TD 166' AET Not taken.			
175			Core Assays			
		No.	Interval / CaF_2 / SiO_2	$CaCO_3$		
		240	121.5-124 / 93.42 / 4.20	1.06		
		241	124-129 / 95.54 / 2.24	0.90		
180		242	129-132 / 92.90 / 5.64	0.94		
		243	132-135.5 / 83.76 / 8.04	1.02		
		244	135.5-136 / 18.22 / 47.20	1.42		
185			Skyline Labs			
190						
195						

PINCOCK, ALLEN & HOLT INC

1978

McFadden Peak Fluorspar DRILL HOLE LOG

COORDINATES		COLLAR ELEV. 5895' N 90 W -66°	TD	HOLE NO.
NORTH 10,882 (Est)	EAST 10,540 (Est)			T-11
PROJECT NUMBER 135.01	DATE DRILLED 10/16/78 — 10/27/78 and 11/-/-	LOGS RUN AET 162' -69°	LOGGED BY W.C. Peters	
DRILL RIG Longyear 44	HOLE DIAMETER NX	DRILL ~~ING~~ ~~MEDIUM~~ Rotary 0-83' DDH 83'+	Longyear DRILLER R. LaChance	PAGE NO. 1 OF

(FT) DEPTH	GRAPHIC LOG	Box No. & broken zone notes	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
			0 – 83' Diabase soil and weathered Diabase			Reentered Hole at 180'. Boxed as 1-A beyond 180'
5						Rotary Drill in Diabase to 83'
10						
15						
20						
25						
30						
35						
40						
45						

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-11
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 2 OF

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
55						
60						
65						
70						
75						
80						
85		1	Diabase 83-94' weathered, disintegrated, dgy-red color.	100	0	
90		2		100	6	
95		Intense fract.	94-98' Q3t, red-brn, fi-med gr., mottled, w/ vestiges of X-lamin & load casts.			25 Fractures, to axis
			98-122 Q3t (page 3)			

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-11
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 3 OF

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
105		3 Moderate Fract.	Q3t, buff-brn, med gr. with vestiges of argillite-type (hornfels-type) texture, ie: x lamin, slump, load casts.	100	7	→10 →45
110		4		53 (0.2' core 1 6-21)	2	Bddg 70° to axis
115		Intense, ravell				
120		Intense, gouge				
125		Clay-Gouge, CaF_2(?) Sple 122-26 Ravell	122-126 Clay gouge, tan-brn w/ small frags of Q3t, Db. w/ biot-sericite. Fluorite minor if present.			
	?	Red FeOx 5	126-128 Void reported by driller.	82	4	
130		Intense, small frags.	Q3t, buff-brown, med gr., w/ vestiges of X-lamin, slump, load casts (Argillite-hnfels texture)			→70 on beds moderate red FeOx
135						
140		6	139-180 Hnfls, tan-brn, and Q3t, Lgy-tan, interbdd. Thin lamin. w/ shrinkage cracks, local xbddg, & slump texture.	61	15	Bddg 75° →75 on bds weak yel-brn FeOx bleeding on frs.
145						

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH	EAST			T-11
PROJECT NUMBER	DATE DRILLED	LOGS RUN	LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILLING MEDIUM	DRILLER	PAGE NO. 4 OF

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
155		7		100	46	Bddg 70°
160						
165		8		100	16	Bddg 75°
						10 ⟨ ⟩ → 75 on bds
170		9		95	23	
175						
180		10		100	100	Bddg 65°
		Box 1 of Hole 10-A	180-207.5	100	66	Re-entered hole at 180' after drilling T-13
185			Hnfls, Lay-dgy-tan-brown and Qzt, Lay-tan, fi gr.			water-mud loss at 188'
		2 intense Fract w/ white Clay coating	Thin interbedded and laminated. Cross lamin. w/ shrink cracks, slump struct, & disseminated fi gr. pyrite	97	44	Bddg 70-75°
190						
195			Spotted, with spots increasing below 203'.			70-75 on bds
			Yel-brn FeOx bleeding on all frs.			30 Yel-brn FeOx & red-brn FeOx
		3		100	65	

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR		HOLE NO.
NORTH	EAST			T-11
PROJECT NUMBER	DATE DRILLED		LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILL	DRILLER	PAGE NO. 5 OF

DEPTH	GRAPHIC LOG	BOX NO. & BROKEN ZONE NOTES	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
205						Fractures multi-directions w/ crusty blk MnOx & minor pyrite. from 185 to ___
210			207.5 - 214 Hnfls, Lgy-Lbrn banded-lamin. & minor Qzt, Lgy, fi gr. slumps, x-lamin.			
215						
220			214 - 231.5 Field Report 220 - 221 Mud above 221 - 228 possible Spar Xtals in fractures 228 - 231.5 broken with quartz chips			* Assay #245 @ 122 - 126' CaF_2 = 0.84% SiO_2 = 52.94% $CaCO_3$ = 0.82%
225						
230						
235						
240						
245						

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR ELEV. 5805' N 20 W -45°	TD 124'	HOLE NO.
NORTH 11,000	EAST 10,960			T-12
PROJECT NUMBER 135.01	DATE DRILLED 10/27/78 10/30/78	LOGS RUN	LOGGED BY W.C. Peters	
DRILL RIG Longyear 44	HOLE DIAMETER NX	DRILLING MEDIUM	DRILLER Longyear C. Edlund	PAGE NO. 1 / OF 3

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
5						0-72' Rock bit
10			Overburden, Weathered Diabase, Soil			
15						
20						
25						
30						
35						
40						
45						

PINCOCK, ALLEN & HOLT INC 1978

DRILL HOLE LOG

COORDINATES		COLLAR		HOLE NO.
NORTH	EAST			T-12
PROJECT NUMBER	DATE DRILLED		LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILL	DRILLER	PAGE NO. 2 OF 3

DEPTH	GRAPHIC LOG	BOX NO. & BROKEN ZONE NOTES	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
55, 60, 65, 70			Diabase and Soil			0-72' Rock bit in Diabase
75, 80		1	72-82 Diabase, brown, soft	91	08	Dark brown FeOx on Diabase fractures. 65 / 15
						Bedding Faint, 60° to axis
85		2	82-87 Quartzite, Lgy-pink, med gr. w/ vuggy qz vlts. All in ravelled pieces	69	06	Core recov. 82-87' = 30%
			87-89 quartz vein, Lgy-BX, w/ minor Spar, purple, vuggy			Limonite casts after sulfides
90		Spl's 89-92, 92-94, 94-97, 97-100, 100-103', 103-104	89-92 Qzt, Lgy, medgr. w/ ½-1½" vuggy qz-spar veinlets. Spar is Light purple			
			92-93 Ravelled qz-spar			
			93-94 Vuggy qz & spar			
95			94-103 Fluorspar, Lgy-Lgrn, co xlline, massive. End at 94' is ground away. Sugar spar at 96.5-98. Weak CuOx stain			Blk MnOx & yel-brn FeOx on fractures. 50 / 25
		3		82	19	

"PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR	-	HOLE NO.
NORTH	EAST			T-12
PROJECT NUMBER	DATE DRILLED		LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILL	DRILLER	PAGE NO. 3 OF 3

DEPTH	GRAPHIC LOG	BOX NO. & BROKEN ZONE NOTES	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
						100% recov. 94-103
105			103-106 Fragments. Spar, sugar spar to Qzt Lgy, med gr.			30% recov. 103-106'
		4	106-124 Qzt, L brn w/ few spots & lamin. Faint Shrink cracks	100	23	Bedding 50-60°
110						50 ↑ ↓ 60 on bddg
			1/4" veinlets qz & purple Spar 118.5-122'			blk MnOx Yel-brn FeOx minor vuggy qz.
115		5		88	13	
120						
125			TD 124' AET Not taken.			
130						
135			CORE ASSAYS			
		No.	Interval / CaF_2 / SiO_2 / $CaCO_3$			
		246	89-92'			
		247	92-94'			
140		248	94-97'			
		249	97-100'			
		250	100-103'			
145		251	103-104'			
			Assays by Rocky Mountain Geochemical Corp			

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR ELEV.		HOLE NO.
NORTH 10,882 (Est)	EAST 10,540 (Est)	5895' N 90 W Vertical	TD 320'	T-13
PROJECT NUMBER 135.01	DATE DRILLED 10/31/78 11/21/78	LOGS RUN AET 165' -870	LOGGED BY W.C. Peters	
DRILL RIG Longyear 44	HOLE DIAMETER NX	DRILLING MEDIUM DDH	DRILLER Longyear La Chance	PAGE NO. 1 / OF 7

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
			Soil & Diabase			
5						0-83 Rock bit in Diabase
10						
15						
20						
25						
30						
35						
40						
45						

PINCOCK, ALLEN & HOLT INC

APRIL 1978

DRILL HOLE LOG

COORDINATES		COLLAR		HOLE NO.
NORTH	EAST			T-13
PROJECT NUMBER	DATE DRILLED		LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILL	DRILLER	PAGE NO. 2 OF 7

DEPTH	GRAPHIC LOG	BOX NO. & BROKEN ZONE NOTES	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
55						
60						
65						
70						
75						
80						
85		1	83-109' Diabase, Lgy-olive green, weathered, crumbly	100	11	
90						
95		2		95	08	

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR		HOLE NO.
NORTH	EAST			T-13
PROJECT NUMBER	DATE DRILLED		LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILL	DRILLER	PAGE NO. 3 OF 7

DEPTH	GRAPHIC LOG	BOX NO. & BROKEN ZONE NOTES	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
105		3		100	0	
110		4	109-113' Gouge and fragments, Qzt, pink, fi-med gr	48	04	
115			113-129' Qzt, Lgy-pink, fi-med gr., all in fragments. Rolled frags @ 121-124', 16% core recov.			55 ↖/↗30 Fractures to axis
120						121-131 Hole caving
125						
130		5	129-138' Qzt tan-reddish brown med-fi gr. indistinct lamin. Blotchy	86	08	
135						↗20-V brn FeOx
						1 sack sealant
140		6	138'-156' Qzt Lgy-buff. Fi-med gr. Faint x-lamin.	100	39	brn-red bleeding on fractures.
145						Bedding 75° to axis
						↗75 on bddg brn FeOx

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR		HOLE NO.
NORTH	EAST			T-13
PROJECT NUMBER	DATE DRILLED		LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILL	DRILLER	PAGE NO. 4 OF 7

DEPTH	GRAPHIC LOG	BOX NO. & BROKEN ZONE NOTES	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
155		7		100	19	
160			156-161' Qzt, Lgy-red, fi gr. Fi lamin. x-lamin.			Brn-red bleeding on frs.
165		8	161-169' Qzt, Lgy w/ few dgy spotted bands. Fi-med gr. Fi lamin	100	63	Bddg 70° Brn-yel bleeding on frs.
170		9	169-178' Qzt, tan-reddish brn, fi gr. w/ shrinkage cracks, Blotchy	100	28	75 ↔ ↔ 75 on bddg 30
175						yellow bleeding on fractures
180		10	178-208' Qzt, lgy-tan, fi gr. w/ shrinkage cracks, fine x-lamin. slumps, pseudochannels	79	16	yellow-red bleeding on fractures
185						Bddg 70°
190		11		100	69	30 ↔ 50
195						

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR		HOLE NO.
NORTH	EAST			T-13
PROJECT NUMBER	DATE DRILLED		LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILL	DRILLER	PAGE NO. 5 OF 7

DEPTH	GRAPHIC LOG	BOX NO. & BROKEN ZONE NOTES	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
205		12		86	36	80 ← | | → 40 weak brn FeOx
210		13	208-289 Hornfels, Lgy-Dgy fine x-lamin, weakly spotted, slumps. w/ few thin Ss-Qzt bands, med-co gr.	100	40	
215						
220		14		100	05	
225						
230		15		100	0	70 ↑ | → 40 moderate brown FeOx
235		16		91	15	Beddg. 70°
240						
245		17		90	18	

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR		HOLE NO.
NORTH	EAST			T-13
PROJECT NUMBER	DATE DRILLED		LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILL	DRILLER	PAGE NO. 6 OF 7

DEPTH	GRAPHIC LOG	BOX NO. & BROKEN ZONE NOTES	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
25.5		18		100	38	75 +5 Light FeOx, brn.
26.0						80 40 V
26.5		19		100	43	Bddg 60-80°
27.0						15 brown FeOx, gouge.
27.5		20		95	20	270-281 2 sacks sealant
28.0						
28.5		21		87	20	
29.0			289-295' Qzt, gray, med gr. faint laminar. color change to pink at 292			
29.5		22	295-299' Qzt, gray-pink, med gr., mottled, faint laminar.	94	20	
			299-306.5			

PINCOCK ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR		HOLE NO.
NORTH	EAST			T-13
PROJECT NUMBER	DATE DRILLED		LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILL	DRILLER	PAGE NO. 7 OF 7

DEPTH	GRAPHIC LOG	BOX NO. & BROKEN ZONE NOTES	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
			Q3t, gray, med gr. massive			
305		23		82	08	
			306.5 - 320 Q3t, gray, med gr., massive Few 1/8" vuggy q3 vlts at 317'.			
310						
315		24		92	07	Beddy 85°
320						
			TD 320' AET at 165' = 87°			
325						
0						
5						
0						
5						

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR ELEV. 5805' N2W -75°	TD	HOLE NO.
NORTH 11,000	EAST 10,960			T-14
PROJECT NUMBER 135.01	DATE DRILLED 10/31/78	LOGS RUN	LOGGED BY W.C. Peters	
DRILL RIG Longyear 44	HOLE DIAMETER NX	DRILLING MEDIUM	Longyear DRILLER C. Edlund	PAGE NO. 1 / OF

DEPTH	GRAPHIC LOG		DESCRIPTION FIELD IDENTIFICATION	CORE REC. %		REMARKS
			Diabase soil and Diabase			Rock bit in Diabase to 82'
5						
10						
15						
20						
25						
30						
35						
40						
45						

PINCOCK, ALLEN & HOLT INC

APRIL 1978

DRILL HOLE LOG

COORDINATES		COLLAR		HOLE NO.
NORTH	EAST			T-14
PROJECT NUMBER	DATE DRILLED		LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILL	DRILLER	PAGE NO. 2 OF

DEPTH	GRAPHIC LOG	BOX NO. & BROKEN ZONE NOTES	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
55, 60, 65, 70, 75, 80						Diabase "sand" at bottom of casing
85, 90		1	82 - 118.5 Diabase gray-green, soft to moderate hardness.	100	04	
95		2		100	34	

PINCOCK, ALLEN & HOLT INC

1978

DRILL HOLE LOG

COORDINATES		COLLAR		HOLE NO.
NORTH	EAST			T-14
PROJECT NUMBER	DATE DRILLED		LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILL	DRILLER	PAGE NO. 3 OF

DEPTH	GRAPHIC LOG	BOX NO. & BROKEN ZONE NOTES	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
						Water Table 100'
105		3		90	0	
110						
115		4		68	03	
120			118.5 - 142' Qzt, L gray - L green med gr. and Hnfls, Lgy - L grn faint lamin.			
125						
130		5		86	05	
135			1/8" qz vlts at 142'			
140		6		95	11	
145			142 - 181' Qzt Lgy - tan & Hnfls Lgy - dgy Faint lamin.			

PINCOCK ALLEN & HOLT INC

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DRILL HOLE LOG

COORDINATES		COLLAR		HOLE NO.
NORTH	EAST			T-14
PROJECT NUMBER	DATE DRILLED		LOGGED BY	
DRILL RIG	HOLE DIAMETER	DRILL	DRILLER	PAGE NO. 4 OF

DEPTH	GRAPHIC LOG	Box NO. & Broken Zone Notes	DESCRIPTION FIELD IDENTIFICATION	CORE REC. %	RQD %	REMARKS
155		7		100	10	
160		8		100	07	
165						169-180 2 sacks Sealant
		9		69	0	5 sacks cement
170						
175						
180						
185	OPEN	10	181-190'-No core recovery. Includes void. Cemented.			187' lost mud
190						open space-Void 186-190
195			Field log (telephone) 190-205 Hornfels 205-218 Void 218-219 Spar stringers 219-220 Diabase 220-242 Siltstones			Cementing 190-218

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O. T. SMITH ROAD CONTROL POINT DATA

			COORDINATES	
STATION	BEARING	DISTANCE	N. OR S.	E. OR W.
DH 9			10906.016	10927.115
	S54-57E	159.0		
Pt.1			10814.704	11057.281
	S33-53E	175.0		
Pt.2			10669.423	11154.844
	S 9-20E	239.0		
Pt.3			10433.587	11193.604
	S36-52E	119.0		
Pt.4 Rd.			10338.383	11264.999
Pt.3			10433.587	11193.604
	N66-43E	184.0		
Pt.5			10506.318	11362.619
	N32-15E	131.0		
Pt.6			10617.109	11432.523
	N57-19E	117.0		
Pt.7			10680.288	11530.998
	N39-57E	148.0		
Pt.8			10793.746	11626.032
	N76-22E	196.0		
Pt.9			10839.944	11816.509
	N67-50E	200.0		
Pt.10			10915.405	12001.727
	S32-05E	120.0		
NE Cor. 14A			10813.732	12065.465
Pt.10			10915.405	12001.727
	S62-52E	142.0		
Pt.12			10850.644	12128.100
	S75-56E	137.0		
Pt.13			10817.346	12260.991
	S53-17E	34.0		
SE Cor.M.24			10797.019	12288.246

*This page refers to Figures 5-3 & 6-2